

# SUBSTITUTE SEQUENCE LISTING

<110> JESTIN, JEAN-LUC  
VICHIER-GUERRE, SOPHIE  
FERRIS, STEPHANE

<120> METHODS FOR OBTAINING THERMOSTABLE ENZYMES, DNA POLYMERASE I  
VARIANTS FROM THERMUS AQUATICUS HAVING NEW CATALYTIC ACTIVITIES,  
METHODS FOR OBTAINING THE SAME, AND APPLICATIONS OF THE SAME

<130> 295295US-10590810

<140> 10/590,810

<141> 2006-08-25

<150> PCT/IB05/00734

<151> 2005-02-25

<150> 10/787,219

<151> 2004-02-27

<160> 108

<170> PatentIn version 3.3

<210> 1

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic oligonucleotide

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taacaatagg ccgccaccc cttc

24

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<400> 2

gagtttttgt tctgcggc

18

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<223> Description of Artificial Sequence: Synthetic oligonucleotide

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27



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 <223> This region may encompass the bases "car" or "avy"  
  
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<210> 6  
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gcagg 65

<210> 7  
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<220>  
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cc 62

<210> 8  
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<220>  
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catcc                                                                    65

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tg                                                                    62

<210> 11

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 <223> n is a, c, g, or t  
  
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 <222> (28)..(30)  
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 ttggccagga acttgtcc 18  
  
 <210> 19  
 <211> 1688  
 <212> DNA  
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 <222> (3)..(1688)  
  
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 Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Gly Ser Pro Lys



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gcc ctg gag gag gcc ccc tgg ccc ccg ccg gaa ggg gcc ttc gtg ggc Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly	20	25	30	95
ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt ctg gcc ctg Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu	35	40	45	143
gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys	50	55	60	191
gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu	65	70	75	239
agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp	80	85	90	287
ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu	100	105	110	335
ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag gcg ggg gag Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu	115	120	125	383
cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu	130	135	140	431
gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro	145	150	155	479
ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg cgc ctg gac Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp	160	165	170	527
gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag gag atc gcc Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala	180	185	190	575
cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc ttc aac ctc Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu	195	200	205	623
aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg ctt Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu	210	215	220	671
ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala	225	230	235	719
gcc gtc ctg gag gcc ctt cgc gag gcc cac ccc atc gtg gag aag atc Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile	240	245	250	767



ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac att ggc ccc Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Gly Pro 260 265 270	815
ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac acc cgc ttc Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe 275 280 285	863
aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc gat ccc aac Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn 290 295 300	911
ctc cag aac gtc ccc gtc cgc acc ccg ctt ggg cag agg atc cgc cgg Leu Gln Asn Val Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg 305 310 315	959
gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg gac tat agc Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser 320 325 330 335	1007
cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac gag aac ctg Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu 340 345 350	1055
atc cgg gtc ttc cag gag ggg cgg gat atc cac acg gag acc gcc agc Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser 355 360 365	1103
tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg atg cgc cgg Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg 370 375 380	1151
gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg tcg gcc cac Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His 385 390 395	1199
cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc cag gcc ttc Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe 400 405 410 415	1247
att gag cgc tac ttt cag agc ttc ccc aag gtg cgg gcc tgg att gag Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu 420 425 430	1295
aag acc ctg gag gag ggt agg agg cgg ggg tac gtg gag acc ctc ttc Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe 435 440 445	1343
ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg aag agc gtg Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val 450 455 460	1391
cgg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc cag ggc acc Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr 465 470 475	1439
gcc gcc gac ctc acg aag ctg gct atg gtg aag ctc ttc ccc agg ctg Ala Ala Asp Leu Thr Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu 480 485 490 495	1487



gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac gag ctg gtc	1535
Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val	
500 505 510	

ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg ctg gcc aag	1583
Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys	
515 520 525	

gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg gag gtg gag	1631
Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu	
530 535 540	

gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg gcc gca ctg	1679
Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu	
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gtg ccg cgc	1688
Val Pro Arg	
560	

<210> 20  
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 <213> Thermus aquaticus

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20 25 30	

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala	
35 40 45	

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala	
50 55 60	

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser	
65 70 75 80	

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro	
85 90 95	

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly	
100 105 110	

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg	
115 120 125	

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu	
130 135 140	



Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
 145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
 165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
 180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
 195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
 210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
 225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
 245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Gly Pro Leu  
 260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
 275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
 290 295 300

Gln Asn Val Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
 305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
 325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
 340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
 355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
 370 375 380



Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
 385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
 405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
 420 425 430

Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
 435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
 450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
 465 470 475 480

Ala Asp Leu Thr Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
 485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
 500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
 515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
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Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
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Pro Arg

<210> 21  
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 <212> DNA  
 <213> Thermus aquaticus

<220>  
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 <222> (3)..(1688)

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47



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gcc ctg gag gag gcc ccc tgg ccc ccg ccg gaa ggg gcc ttc gtg ggc Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly 20 25 30				95
ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt ctg gcc ctg Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu 35 40 45				143
gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys 50 55 60				191
gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu 65 70 75				239
agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp 80 85 90 95				287
ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu 100 105 110				335
ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag gcg ggg gag Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu 115 120 125				383
cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu 130 135 140				431
gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro 145 150 155				479
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aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg ctt Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu 210 215 220				671
ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala 225 230 235				719
gcc gtc ctg ggg gcc ctc cgc gag gcc cac ccc atc gtg gag aag atc Ala Val Leu Gly Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile 240 245 250 255				767



ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac att gac ccc Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro 260 265 270	815
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gcc ttc atc gcc gag gag ggg tgg cta ttg gtg acc ctg gac tat agc Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Thr Leu Asp Tyr Ser 320 325 330 335	1007
cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac gag aac ctg Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu 340 345 350	1055
atc cgg gtc ttc cag gag ggg cgg gac atc cac acg gag acc gcc agc Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser 355 360 365	1103
tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg atg cgc cgg Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg 370 375 380	1151
gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg tcg gcc cac Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His 385 390 395	1199
cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc cag gcc ttc Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe 400 405 410 415	1247
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ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg aag agc gtg Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val 450 455 460	1391
cgg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc cag ggc acc Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr 465 470 475	1439
gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc ccc agg ctg Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu 480 485 490 495	1487



gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac gag ctg gtc 1535  
 Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val  
                   500                                  505                                  510

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 Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys  
                   515                                  520                                  525

gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg gag gtg gag 1631  
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Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala  
                   35                                  40                                  45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala  
                   50                                  55                                  60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser  
 65                                  70                                  75                                  80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro  
                   85                                  90                                  95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly  
                   100                                  105                                  110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg  
                   115                                  120                                  125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
                   130                                  135                                  140



Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
 145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
 165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
 180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
 195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
 210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
 225 230 235 240

Val Leu Gly Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
 245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
 260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
 275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
 290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
 305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Thr Leu Asp Tyr Ser Gln  
 325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
 340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
 355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
 370 375 380



Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
 385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
 405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
 420 425 430

Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
 435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
 450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
 465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
 485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
 500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
 515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
 530 535 540

Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
 545 550 555 560

Pro Arg

<210> 23  
 <211> 1688  
 <212> DNA  
 <213> Thermus aquaticus

<220>  
 <221> CDS  
 <222> (3)..(1688)

<400> 23  
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 Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Gly Ser Pro Lys

47



1	5	10	15	
gcc ctg gag gag gcc ccc tgg ccc ccg ccg gaa ggg gcc ttc gtg ggc Ala Leu Glu Glu Ala Pro Trp Pro Pro Glu Gly Ala Phe Val Gly	20	25	30	95
ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt ctg gcc ctg Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu	35	40	45	143
gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys	50	55	60	191
gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu	65	70	75	239
agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp	80	85	90	287
ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu	100	105	110	335
ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag gcg ggg gag Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu	115	120	125	383
cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu	130	135	140	431
gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro	145	150	155	479
ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg cgc ctg gac Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp	160	165	170	527
gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag gag atc gcc Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala	180	185	190	575
cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc ttc caa ctc Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Gln Leu	195	200	205	623
aac caa cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg ctt Asn Gln Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu	210	215	220	671
ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala	225	230	235	719
gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg gag aag atc Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile	240	245	250	767



ctg cag tac cgg gag ctc aac aag ctg aag agc acc caa att act cag Leu Gln Tyr Arg Glu Leu Asn Lys Leu Lys Ser Thr Gln Ile Thr Gln 260 265 270	815
ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac acc cgc ttc Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe 275 280 285	863
aac cag acg gcc acg caa acg ggc agg cta agt agc tcc cag ccc aac Asn Gln Thr Ala Thr Gln Thr Gly Arg Leu Ser Ser Ser Gln Pro Asn 290 295 300	911
ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg atc cgc cgg Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg 305 310 315	959
acc ttc atc gcc gag gag ggg agg cta ttg gtg gcc ctg gac tat aac Thr Phe Ile Ala Glu Glu Gly Arg Leu Leu Val Ala Leu Asp Tyr Asn 320 325 330 335	1007
cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac gag aac ctg Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu 340 345 350	1055
atc cgg gtc ttc cag gag ggg cgg gac atc cac acg gag acc gcc agc Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser 355 360 365	1103
tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg atg cgc cgg Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg 370 375 380	1151
gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg tcg gcc cac Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His 385 390 395	1199
cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc cag gcc ttc Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe 400 405 410 415	1247
att gag cgc tac ttt cag agc ttc ccc aag gtg cgg gcc tgg att gag Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu 420 425 430	1295
aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag acc ctc ttc Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe 435 440 445	1343
ggc cgc cgc cgc tac ctg cca gac cta gag gcc cag gtg aag aat gtg Gly Arg Arg Arg Tyr Leu Pro Asp Leu Glu Ala Gln Val Lys Asn Val 450 455 460	1391
cgg gag gcg gcc gag cgc agg gcc ttc aac atg ccc gtc cag ggc acc Arg Glu Ala Ala Glu Arg Arg Ala Phe Asn Met Pro Val Gln Gly Thr 465 470 475	1439
gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc ccc agg ctg Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu 480 485 490 495	1487



gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac gag ctg gtc 1535  
 Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val  
                   500                                  505                                  510

ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg ctg gcc aag 1583  
 Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys  
                   515                                  520                                  525

gag gtc atg gag ggg gtg tat ccc ctg gcc gtg cct ctg gag gtg gag 1631  
 Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu  
                   530                                  535                                  540

gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg gcc gca ctg 1679  
 Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu  
                   545                                  550                                  555

gtg ccg cgc 1688  
 Val Pro Arg  
 560

<210> 24  
 <211> 562  
 <212> PRT  
 <213> Thermus aquaticus

<400> 24

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Gly Ser Pro Lys Ala  
 1                                  5                                  10                                  15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe  
                   20                                  25                                  30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala  
                   35                                  40                                  45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala  
                   50                                  55                                  60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser  
 65                                  70                                  75                                  80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro  
                   85                                  90                                  95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly  
                   100                                  105                                  110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg  
                   115                                  120                                  125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu



130		135		140
Gly 145	Glu 146	Glu 147	Arg 148	Leu 149
		Leu 150	Trp 151	Leu 152
			Tyr 153	Arg 154
			Glu 155	Val 156
			Glu 157	Arg 158
			Pro 159	Leu 160
Ser 161	Ala 162	Val 163	Leu 164	Ala 165
			His 166	Met 167
			Glu 168	Ala 169
			Thr 170	Gly 171
			Val 172	Arg 173
			Leu 174	Asp 175
Ala 176	Tyr 177	Leu 178	Arg 179	Ala 180
				Leu 181
				Ser 182
				Leu 183
				Glu 184
				Val 185
				Ala 186
				Glu 187
				Glu 188
				Ile 189
				Ala 190
				Arg 191
Leu 192	Glu 193	Ala 194	Glu 195	Val 196
				Phe 197
				Arg 198
				Leu 199
				Ala 200
				Gly 201
				His 202
				Pro 203
				Phe 204
				Gln 205
				Leu 206
				Asn 207
Gln 208	Arg 209	Asp 210	Gln 211	Leu 212
				Glu 213
				Arg 214
				Val 215
				Leu 216
				Phe 217
				Asp 218
				Glu 219
				Leu 220
				Gly 221
				Leu 222
				Pro 223
Ala 224	Ile 225	Gly 226	Lys 227	Thr 228
				Glu 229
				Thr 230
				Lys 231
				Thr 232
				Gly 233
				Lys 234
				Arg 235
				Ser 236
				Thr 237
				Ser 238
				Ala 239
				Ala 240
Val 241	Leu 242	Glu 243	Ala 244	Leu 245
				Arg 246
				Glu 247
				Ala 248
				His 249
				Pro 250
				Ile 251
				Val 252
				Glu 253
				Lys 254
				Ile 255
				Leu 256
Gln 257	Tyr 258	Arg 259	Glu 260	Leu 261
				Asn 262
				Lys 263
				Leu 264
				Lys 265
				Ser 266
				Thr 267
				Gln 268
				Ile 269
				Thr 270
				Gln 271
				Leu 272
Pro 273	Asp 274	Leu 275	Ile 276	His 277
				Pro 278
				Arg 279
				Thr 280
				Gly 281
				Arg 282
				Leu 283
				His 284
				Thr 285
				Arg 286
				Phe 287
				Asn 288
Gln 289	Thr 290	Ala 291	Thr 292	Gln 293
				Thr 294
				Gln 295
				Arg 296
				Leu 297
				Ser 298
				Ser 299
				Ser 300
				Gln 301
				Pro 302
				Asn 303
				Leu 304
Gln 305	Asn 306	Ile 307	Pro 308	Val 309
				Arg 310
				Thr 311
				Pro 312
				Leu 313
				Gly 314
				Gln 315
				Arg 316
				Ile 317
				Arg 318
				Arg 319
				Thr 320
Phe 321	Ile 322	Ala 323	Glu 324	Glu 325
				Gly 326
				Arg 327
				Leu 328
				Leu 329
				Val 330
				Ala 331
				Leu 332
				Asp 333
				Tyr 334
				Asn 335
				Gln 336
Ile 337	Glu 338	Leu 339	Arg 340	Val 341
				Leu 342
				Ala 343
				His 344
				Leu 345
				Ser 346
				Gly 347
				Asp 348
				Glu 349
				Asn 350
				Leu 351
				Ile 352
Arg 353	Val 354	Phe 355	Gln 356	Glu 357
				Gly 358
				Arg 359
				Asp 360
				Ile 361
				His 362
				Thr 363
				Glu 364
				Thr 365
				Ala 366
				Ser 367
				Trp 368
Met 369	Phe 370	Gly 371	Val 372	Pro 373
				Arg 374
				Glu 375
				Ala 376
				Val 377
				Asp 378
				Pro 379
				Leu 380
				Met 381
				Arg 382
				Arg 383
				Ala 384



Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
 385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
 405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
 420 425 430

Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
 435 440 445

Arg Arg Arg Tyr Leu Pro Asp Leu Glu Ala Gln Val Lys Asn Val Arg  
 450 455 460

Glu Ala Ala Glu Arg Arg Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
 465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
 485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
 500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
 515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
 530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
 545 550 555 560

Pro Arg

<210> 25  
 <211> 1688  
 <212> DNA  
 <213> *Thermus aquaticus*

<220>  
 <221> CDS

<222> (3)..(1688)

<400> 25



cc atg gcc tct ggt ggc ggt ggc tgt ggt ggc ggt ggc agc ccc aag	47
Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Gly Ser Pro Lys	
1 5 10 15	
gcc ctg gag gag gcc ccc tgg ccc ccg ccg gaa ggg gcc ttc gtg ggc	95
Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly	
20 25 30	
ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt ctg gcc ctg	143
Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu	
35 40 45	
gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa	191
Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys	
50 55 60	
gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg	239
Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu	
65 70 75	
agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac	287
Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp	
80 85 90 95	
ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag	335
Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu	
100 105 110	
ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag gcg ggg gag	383
Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu	
115 120 125	
cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt	431
Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu	
130 135 140	
gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc	479
Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro	
145 150 155	
ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg cgc ctg gac	527
Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp	
160 165 170 175	
gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag gag atc gcc	575
Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala	
180 185 190	
cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc ttc aac ctc	623
Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu	
195 200 205	
aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg ctt	671
Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu	
210 215 220	
ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc	719
Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala	
225 230 235	
gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg gag aag atc	767



Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile 240 245 250 255	
ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac att gac ccc Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro 260 265 270	815
ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac acc cgc ttc Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe 275 280 285	863
aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc gat ccc aac Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn 290 295 300	911
ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg atc cgc cgg Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg 305 310 315	959
gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg gac tat agc Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser 320 325 330 335	1007
cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac gag aac ctg Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu 340 345 350	1055
atc ccg gtc ttc cag gag ggg ccg gac atc cac acg gag acc gcc agc Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser 355 360 365	1103
tgg atg ttc ggc gtc ccc ccg gag gcc gtg gac ccc ctg atg cgc cgg Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg 370 375 380	1151
gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg tcg gcc cac Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His 385 390 395	1199
cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc cag gcc ttc Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe 400 405 410 415	1247
att gag cgc tac ttt cag agc ttc ccc aag gtg ccg gcc tgg att gag Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu 420 425 430	1295
aag acc ctg gag gag ggc agg agg ccg ggg tac gtg gag acc ctc ttc Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe 435 440 445	1343
ggc cgc cgc cgc tac gtg cca gac cta gag gcc ccg gtg aag agc gtg Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val 450 455 460	1391
ccg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc cag ggc acc Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr 465 470 475	1439
gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc ccc agg ctg Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu	1487



480	485	490	495	
gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac gag ctg gtc				1535
Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val				
500		505	510	
ctc gag gcc cca aaa gag agg gcg gag gcc gtg gcc cgg ctg gcc aag				1583
Leu Glu Ala Pro Lys Glu Arg Ala Glu Ala Val Ala Arg Leu Ala Lys				
515		520	525	
gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg gag gtg gag				1631
Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu				
530		535	540	
gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg gcc gca ctg				1679
Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu				
545		550	555	
gtg ccg cgc				1688
Val Pro Arg				
560				
<210> 26				
<211> 562				
<212> PRT				
<213> Thermus aquaticus				
<400> 26				
Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Gly Ser Pro Lys Ala				
1	5	10	15	
Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe				
20		25	30	
Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala				
35		40	45	
Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala				
50		55	60	
Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser				
65		70	75	80
Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro				
85		90	95	
Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly				
100		105	110	
Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg				
115		120	125	



Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
 130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
 145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
 165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
 180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
 195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
 210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
 225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
 245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
 260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
 275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
 290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
 305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
 325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
 340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
 355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala



370                                      375                                      380  
 Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
 385                                      390                                      395                                      400  
 Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
                                     405                                      410                                      415  
 Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
                                     420                                      425                                      430  
 Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
                                     435                                      440                                      445  
 Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
                                     450                                      455                                      460  
 Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
 465                                      470                                      475                                      480  
 Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
                                     485                                      490                                      495  
 Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
                                     500                                      505                                      510  
 Glu Ala Pro Lys Glu Arg Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
                                     515                                      520                                      525  
 Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
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Pro Arg

<210> 27  
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 <213> Thermus aquaticus

<220>  
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Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly	
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Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu	
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gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa	191
Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys	
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gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg	239
Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu	
65 70 75	
agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac	287
Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp	
80 85 90 95	
ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag	335
Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu	
100 105 110	
ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag gcg ggg gag	383
Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu	
115 120 125	
cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt	431
Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu	
130 135 140	
gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc	479
Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro	
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ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg cgc ctg gac	527
Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp	
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gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag gag atc gcc	575
Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala	
180 185 190	
cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc ttc aac ctc	623
Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu	
195 200 205	
aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg ctt	671
Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu	
210 215 220	
ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc	719
Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala	
225 230 235	
gtc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg gag aag atc	767



Val 240	Val	Leu	Glu	Ala	Leu 245	Arg	Glu	Ala	His	Pro 250	Ile	Val	Glu	Lys	Ile 255	
ctg	cag	tac	cgg	gag	ctc	acc	aag	ctg	aag	agc	acc	tac	att	gac	ccc	815
Leu	Gln	Tyr	Arg	Glu 260	Leu	Thr	Lys	Leu	Lys 265	Ser	Thr	Tyr	Ile	Asp	Pro 270	
ttg	ccg	gac	ctc	atc	cac	ccc	agg	acg	ggc	cgc	ctc	cac	acc	cgc	ttc	863
Leu	Pro	Asp	Leu 275	Ile	His	Pro	Arg	Thr 280	Gly	Arg	Leu	His 285	Thr	Arg	Phe	
aac	cag	acg	gcc	acg	gcc	acg	ggc	agg	cta	agt	agc	tcc	gat	ccc	aac	911
Asn	Gln	Thr 290	Ala	Thr	Ala	Thr	Gly 295	Arg	Leu	Ser	Ser	Ser 300	Asp	Pro	Asn	
ctc	cag	aac	atc	ccc	gtc	cgc	acc	ccg	ctt	ggg	cag	agg	atc	cgc	cgg	959
Leu	Gln 305	Asn	Ile	Pro	Val	Arg 310	Thr	Pro	Leu	Gly 315	Gln	Arg	Ile	Arg	Arg	
gcc	ttc	atc	gcc	gag	gag	ggg	tgg	cta	ttg	gtg	gcc	ctg	gac	tat	agc	1007
Ala	Phe	Ile	Ala	Glu	Glu 325	Gly	Trp	Leu	Leu	Val 330	Ala	Leu	Asp	Tyr	Ser 335	
cag	ata	gag	ctc	agg	gtg	ctg	gcc	cac	ctc	tcc	ggc	gac	gag	aac	ctg	1055
Gln	Ile	Glu	Leu	Arg 340	Val	Leu	Ala	His	Leu 345	Ser	Gly	Asp	Glu	Asn 350	Leu	
atc	cgg	gtc	ttc	cag	gag	ggg	cgg	gac	atc	cac	acg	gag	acc	gcc	agc	1103
Ile	Arg	Val 355	Phe	Gln	Glu	Gly	Arg	Asp 360	Ile	His	Thr	Glu	Thr 365	Ala	Ser	
tgg	atg	ttc	ggc	gtc	ccc	cgg	gag	gcc	gtg	gac	ccc	ctg	atg	cgc	cgg	1151
Trp	Met	Phe 370	Gly	Val	Pro	Arg	Glu 375	Ala	Val	Asp	Pro	Leu 380	Met	Arg	Arg	
gcg	gcc	aag	agc	atc	aac	ttc	ggg	gtc	ctc	tac	ggc	atg	tcg	gcc	cac	1199
Ala	Ala	Lys 385	Ser	Ile	Asn	Phe 390	Gly	Val	Leu	Tyr	Gly 395	Met	Ser	Ala	His	
cgc	ctc	tcc	cag	gag	cta	gcc	atc	cct	tac	gag	gag	gcc	cag	gcc	ttc	1247
Arg	Leu	Ser	Gln	Glu	Leu 405	Ala	Ile	Pro	Tyr	Glu 410	Glu	Ala	Gln	Ala 415	Phe	
att	gag	cgc	tac	ttt	cag	agc	ttc	ccc	aag	gtg	cgg	gcc	tgg	att	gag	1295
Ile	Glu	Arg	Tyr 420	Phe	Gln	Ser	Phe	Pro	Lys 425	Val	Arg	Ala	Trp 430	Ile	Glu	
aag	acc	ctg	gag	gag	ggc	agg	agg	cgg	ggg	tac	gtg	gag	acc	ctc	ttc	1343
Lys	Thr	Leu 435	Glu	Glu	Gly	Arg	Arg	Arg 440	Gly	Tyr	Val	Glu	Thr 445	Leu	Phe	
ggc	cgc	cgc	cgc	tac	gtg	cca	gac	cta	gag	gcc	cgg	gtg	aag	agc	gtg	1391
Gly	Arg	Arg 450	Arg	Tyr	Val	Pro	Asp 455	Leu	Glu	Ala	Arg	Val 460	Lys	Ser	Val	
cgg	gag	gcg	gcc	gag	cgc	atg	gcc	ttc	aac	atg	ccc	gtc	cag	ggc	acc	1439
Arg	Glu	Ala	Ala	Glu	Arg	Met 465	Ala	Phe	Asn	Met 475	Pro	Val	Gln	Gly	Thr	
gcc	gcc	gac	ctc	atg	aag	ctg	gct	atg	gtg	aag	ctc	tcc	ccc	agg	ctg	1487
Ala	Ala	Asp	Leu	Met	Lys	Leu	Ala	Met	Val	Lys	Leu	Ser	Pro	Arg	Leu	



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gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac gag ctg gtc				1535
Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val				
	500	505	510	
ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg ctg gcc aag				1583
Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys				
	515	520	525	
gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg gag gtg gag				1631
Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu				
	530	535	540	
gtg ggg ata ggg gag gac cgg ctc tcc gcc aag gag gcg gcc gca ctg				1679
Val Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala Ala Ala Leu				
	545	550	555	
gtg ccg cgc				1688
Val Pro Arg				
560				
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	20	25	30	
Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala				
	35	40	45	
Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala				
	50	55	60	
Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser				
65	70	75	80	
Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro				
	85	90	95	
Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly				
	100	105	110	
Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg				
	115	120	125	



Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
 130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
 145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
 165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
 180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
 195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
 210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Val  
 225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
 245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
 260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
 275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
 290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
 305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
 325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
 340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
 355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala



370                      375                      380  
 Ala Lys Ser Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
 385                      390                      395                      400  
 Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
                     405                      410                      415  
 Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
                     420                      425                      430  
 Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
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 Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
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 Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
 465                      470                      475                      480  
 Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Ser Pro Arg Leu Glu  
                     485                      490                      495  
 Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
                     500                      505                      510  
 Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
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 Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
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 545                      550                      555                      560

Pro Arg

<210> 29  
 <211> 1688  
 <212> DNA  
 <213> *Thermus aquaticus*

<220>  
 <221> CDS  
 <222> (3)..(1688)

<400> 29



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Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly	
20 25 30	
ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt ctg gcc ctg	143
Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu	
35 40 45	
gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa	191
Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys	
50 55 60	
gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg	239
Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu	
65 70 75	
agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac	287
Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp	
80 85 90 95	
ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag	335
Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu	
100 105 110	
ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag gcg ggg gag	383
Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu	
115 120 125	
cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt	431
Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu	
130 135 140	
gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc	479
Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro	
145 150 155	
ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg cgc ctg gac	527
Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp	
160 165 170 175	
gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag gag atc gcc	575
Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala	
180 185 190	
cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc ttc aac ctc	623
Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu	
195 200 205	
aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg ctt	671
Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu	
210 215 220	
ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc	719
Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala	
225 230 235	
gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg gag aag atc	767



Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile 240 245 250 255	
ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac att gac ccc Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro 260 265 270	815
ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac acc cgc ttc Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe 275 280 285	863
aac cag acg gtc acg gcc acg ggc agg cta agt agc tcc gat ccc aac Asn Gln Thr Val Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn 290 295 300	911
ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg atc cgc cgg Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg 305 310 315	959
gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg gac tat agc Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser 320 325 330 335	1007
cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac gag aac ctg Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu 340 345 350	1055
atc cgg gtc ttc cag gag ggg cgg gac atc cac acg gag acc gcc agc Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser 355 360 365	1103
tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg atg cgc cgg Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg 370 375 380	1151
gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg tcg gcc cac Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His 385 390 395	1199
cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc cag gcc ttc Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe 400 405 410 415	1247
att gag cgc tac ttt cag agc ttc ccc aag gtg cgg gcc tgg att gag Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu 420 425 430	1295
aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag acc ctc ttc Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe 435 440 445	1343
ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg aag agc gtg Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val 450 455 460	1391
cgg gag gcg gcc gag cgc atg gcc tac aac atg ccc gtc cag ggc acc Arg Glu Ala Ala Glu Arg Met Ala Tyr Asn Met Pro Val Gln Gly Thr 465 470 475	1439
gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc ccc agg ctg Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu	1487



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Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val	500	505	510	
ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg ctg gcc aag				1583
Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys	515	520	525	
gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg gag gtg gag				1631
Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu	530	535	540	
gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg gcc gca ctg				1679
Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu	545	550	555	
gtg ccg cgc				1688
Val Pro Arg				
560				
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Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe				
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Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala				
	35	40	45	
Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala				
	50	55	60	
Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser				
65	70	75	80	
Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro				
	85	90	95	
Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly				
	100	105	110	
Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg				
	115	120	125	



Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
 130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
 145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
 165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
 180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
 195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
 210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
 225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
 245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
 260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
 275 280 285

Gln Thr Val Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
 290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
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Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
 325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
 340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
 355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala



370                                      375                                      380  
 Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
 385                                      390                                      395                                      400  
 Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
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 Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
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 Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
                                     435                                      440                                      445  
 Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
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 Glu Ala Ala Glu Arg Met Ala Tyr Asn Met Pro Val Gln Gly Thr Ala  
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 Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
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 Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
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 Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
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 Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
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Pro Arg

<210> 31  
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 <212> DNA  
 <213> *Thermus aquaticus*

<220>  
 <221> CDS  
 <222> (3) .. (1688)

<400> 31



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Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly	
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ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt ctg gcc ctg	143
Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu	
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gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa	191
Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys	
50 55 60	
gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg	239
Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu	
65 70 75	
agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac	287
Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp	
80 85 90 95	
ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag	335
Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu	
100 105 110	
ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag gcg ggg gag	383
Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu	
115 120 125	
cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt	431
Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu	
130 135 140	
gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc	479
Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro	
145 150 155	
ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg cgc ctg gac	527
Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp	
160 165 170 175	
gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag gag atc gcc	575
Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala	
180 185 190	
cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc ttc aac ctc	623
Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu	
195 200 205	
aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg ctt	671
Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu	
210 215 220	
ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc	719
Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala	
225 230 235	
gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg gag aag atc	767



Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile 240 245 250 255	
ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac att gac ccc Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro 260 265 270	815
ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac acc cgc ttc Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe 275 280 285	863
aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc gat ccc aac Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn 290 295 300	911
ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg atc cgc cgg Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg 305 310 315	959
gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg gac tat agc Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser 320 325 330 335	1007
cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac gag aac ctg Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu 340 345 350	1055
atc ccg gtc ttc cag gag ggg ccg gac atc cac acg gag acc gcc agc Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser 355 360 365	1103
tgg atg ttc ggc gtc ccc ccg gag gcc gtg gac ccc ctg atg cgc cgg Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg 370 375 380	1151
gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg tcg gcc cac Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His 385 390 395	1199
cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc cag gcc ttc Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe 400 405 410 415	1247
att gag cgc tac ttt cag agc ttc ccc aag gtg ccg gcc tgg att gag Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu 420 425 430	1295
aag acc ctg gag gag ggc agg agg ccg ggg tac gtg gag acc ctc ttc Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe 435 440 445	1343
ggc cgc cgc cgc tac gtg cca gac cta gag gcc ccg gtg aag agc gtg Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val 450 455 460	1391
cgg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc cag ggc acc Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr 465 470 475	1439
gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc ccc agg ctg Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu	1487



480		485		490		495	
gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac gag ctg gtc							1535
Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val							
		500		505		510	
ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg ctg gcc aag							1583
Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys							
		515		520		525	
gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg gag gtg gag							1631
Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu							
		530		535		540	
gtg ggg ata ggg gag gac cgg ctc tcc gcc aag gag gcg gcc gca ctg							1679
Val Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala Ala Ala Leu							
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gtg ccg cgc							1688
Val Pro Arg							
560							
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<213> Thermus aquaticus							
<400> 32							
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							15
Leu	Glu	Glu	Ala	Pro	Trp	Pro	Pro
			20				25
							30
Val	Leu	Ser	Arg	Lys	Glu	Pro	Met
			35				40
							45
Ala	Ala	Arg	Gly	Gly	Arg	Val	His
			50				55
							60
Leu	Arg	Asp	Leu	Lys	Glu	Ala	Arg
			65				70
							75
Val	Leu	Ala	Leu	Arg	Glu	Gly	Leu
			85				90
							95
Met	Leu	Leu	Ala	Tyr	Leu	Leu	Asp
			100				105
							110
Val	Ala	Arg	Arg	Tyr	Gly	Gly	Glu
			115				120
							125



Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala



370	375	380
Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg		
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Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile		
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Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys		
	420	425 430
Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly		
	435	440 445
Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg		
	450	455 460
Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala		
465	470	475 480
Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu		
	485	490 495
Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu		
	500	505 510
Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu		
	515	520 525
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Pro Arg

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 <211> 1688  
 <212> DNA  
 <213> Thermus aquaticus

<220>  
 <221> CDS  
 <222> (3)..(1688)

<400> 33



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Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly	
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ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt ctg gcc ctg	143
Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu	
35 40 45	
gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa	191
Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys	
50 55 60	
gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg	239
Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu	
65 70 75	
agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac	287
Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp	
80 85 90 95	
ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag	335
Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu	
100 105 110	
ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag gcg ggg gag	383
Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu	
115 120 125	
cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt	431
Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu	
130 135 140	
gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc	479
Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro	
145 150 155	
ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg cgc ctg gac	527
Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp	
160 165 170 175	
gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag gag atc gcc	575
Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala	
180 185 190	
cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc ttc aac ctc	623
Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu	
195 200 205	
aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg ctt	671
Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu	
210 215 220	
ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc	719
Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala	
225 230 235	
gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg gag aag atc	767



Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile 240 245 250 255	
ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac att gac ccc Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro 260 265 270	815
ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac acc cgc ttc Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe 275 280 285	863
aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc gat ccc aac Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn 290 295 300	911
ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg atc cgc cgg Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg 305 310 315	959
gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg gac tat agc Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser 320 325 330 335	1007
cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac gag aac ctg Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu 340 345 350	1055
atc cgg gtc ttc cag gag ggg cgg gac atc cac acg gag acc gcc agc Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser 355 360 365	1103
tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg atg cgc cgg Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg 370 375 380	1151
gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg tcg gcc cac Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His 385 390 395	1199
cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc cag gcc ttc Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe 400 405 410 415	1247
att gag cgc tac ttt ctg agc ttc ccc aag gtg cgg gcc tgg att gag Ile Glu Arg Tyr Phe Leu Ser Phe Pro Lys Val Arg Ala Trp Ile Glu 420 425 430	1295
aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag acc ctc ttc Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe 435 440 445	1343
ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg aag agc gtg Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val 450 455 460	1391
cgg gag gcg gcc gag cgc aag gcc ttc aac atg ccc gtc cag ggc acc Arg Glu Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val Gln Gly Thr 465 470 475	1439
gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc ccc agg ctg Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu	1487



480		485		490		495	
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Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val							
	500			505		510	
ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg ctg gcc aag							1583
Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys							
	515			520		525	
gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ctc ctg gag gtg gag							1631
Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Leu Leu Glu Val Glu							
	530			535		540	
gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg gcc gca ctg							1679
Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu							
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gtg ccg cgc							1688
Val Pro Arg							
560							
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Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe							
	20			25		30	
Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala							
	35			40		45	
Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala							
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Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser							
65	70			75		80	
Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro							
	85			90		95	
Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly							
	100			105		110	
Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg							
	115			120		125	



Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
 130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
 145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
 165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
 180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
 195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
 210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
 225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
 245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
 260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
 275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
 290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
 305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
 325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
 340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
 355 360 365



Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
 370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
 385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
 405 410 415

Glu Arg Tyr Phe Leu Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
 420 425 430

Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
 435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
 450 455 460

Glu Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
 465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
 485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
 500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
 515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Leu Leu Glu Val Glu Val  
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Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
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Pro Arg

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 <211> 1688  
 <212> DNA  
 <213> *Thermus aquaticus*

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 <222> (3) .. (1688)



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Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Gly Ser Pro Lys  
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Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly  
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ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt ctg gcc ctg 143  
Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu  
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gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa 191  
Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys  
50 55 60

gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg 239  
Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu  
65 70 75

agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac 287  
Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp  
80 85 90 95

ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag 335  
Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu  
100 105 110

ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag gcg ggg gag 383  
Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu  
115 120 125

cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt 431  
Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu  
130 135 140

gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc 479  
Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro  
145 150 155

ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg cgc ctg gac 527  
Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp  
160 165 170 175

gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag gag atc gcc 575  
Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala  
180 185 190

cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc ttc aac ctc 623  
Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu  
195 200 205

aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg ctt 671  
Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu  
210 215 220

ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc 719  
Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala  
225 230 235



gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg gag aag atc	767
Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile	
240 245 250 255	
ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac att gac ccc	815
Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro	
260 265 270	
ttg cag gac ctc atc cac ccc agt acg ggc cgc ctc cac acc cgc ttc	863
Leu Gln Asp Leu Ile His Pro Ser Thr Gly Arg Leu His Thr Arg Phe	
275 280 285	
aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc gat ccc aac	911
Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn	
290 295 300	
ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg atc cgc cgg	959
Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg	
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gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg gac tat agc	1007
Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser	
320 325 330 335	
cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac gag aac ctg	1055
Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu	
340 345 350	
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Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser	
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Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg	
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cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc cag gcc ttc	1247
Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe	
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Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu	
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Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe	
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Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Glu	
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Arg Glu Ala Ala Glu Arg Met Ala Tyr Asn Met Pro Val Gln Gly Thr	
465 470 475	
gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc ccc agg ctg	1487



Ala	Ala	Asp	Leu	Met	Lys	Leu	Ala	Met	Val	Lys	Leu	Phe	Pro	Arg	Leu		
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ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg ctg gcc aag 1583																	
Leu	Glu	Ala	Pro	Lys	Glu	Gly	Ala	Glu	Ala	Val	Ala	Arg	Leu	Ala	Lys		
			515					520					525				
gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg gag gcg gag 1631																	
Glu	Val	Met	Glu	Gly	Val	Tyr	Pro	Leu	Ala	Val	Pro	Leu	Glu	Ala	Glu		
		530					535					540					
gtg ggg ata ggg gag gat tgg ctc tcc gcc aag gag gcg gcc gca ctg 1679																	
Val	Gly	Ile	Gly	Glu	Asp	Trp	Leu	Ser	Ala	Lys	Glu	Ala	Ala	Ala	Leu		
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gtg ccg cgc 1688																	
Val	Pro	Arg															
560																	
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<213> Thermus aquaticus																	
<400> 36																	
Met	Ala	Ser	Gly	Gly	Gly	Gly	Cys	Gly	Gly	Gly	Gly	Ser	Pro	Lys	Ala		
1			5					10					15				
Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe																	
			20					25					30				
Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala																	
		35					40					45					
Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala																	
		50				55				60							
Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser																	
65				70				75						80			
Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro																	
			85					90					95				
Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly																	
		100					105						110				
Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg																	
		115					120					125					



Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
 130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
 145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
 165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
 180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
 195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
 210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
 225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
 245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
 260 265 270

Gln Asp Leu Ile His Pro Ser Thr Gly Arg Leu His Thr Arg Phe Asn  
 275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
 290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
 305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
 325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
 340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
 355 360 365



Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
 370 375 380  
 Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
 385 390 395 400  
 Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
 405 410 415  
 Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
 420 425 430  
 Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
 435 440 445  
 Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Glu Arg  
 450 455 460  
 Glu Ala Ala Glu Arg Met Ala Tyr Asn Met Pro Val Gln Gly Thr Ala  
 465 470 475 480  
 Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
 485 490 495  
 Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
 500 505 510  
 Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
 515 520 525  
 Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Ala Glu Val  
 530 535 540  
 Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
 545 550 555 560

Pro Arg

<210> 37  
 <211> 1688  
 <212> DNA  
 <213> Thermus aquaticus

<220>  
 <221> CDS  
 <222> (3)..(1688)



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<400> 37
cc atg gcc tct ggt ggc ggt ggc tgt ggt ggc ggt ggc agc ccc aag      47
  Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Gly Ser Pro Lys
    1             5             10             15

gcc ctg gag gag gcc ccc tgg ccc ccg ccg gaa ggg gcc ttc gtg ggc      95
Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly
              20             25             30

ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt ctg gcc ctg      143
Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu
              35             40             45

gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag cct tat aaa      191
Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys
              50             55             60

gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc aaa gac ctg      239
Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu
              65             70             75

agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc ggc gac gac      287
Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp
              80             85             90             95

ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc acc ccc gag      335
Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu
              100            105            110

ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag gcg ggg gag      383
Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu
              115            120            125

cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg ggg agg ctt      431
Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu
              130            135            140

gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg gag agg ccc      479
Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro
              145            150            155

ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg cgc ctg gac      527
Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp
              160            165            170            175

gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag gag atc gcc      575
Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala
              180            185            190

cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc ttc aac ctc      623
Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu
              195            200            205

aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag cta ggg ctt      671
Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu
              210            215            220

ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc acc agc gcc      719
Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala
              225            230            235

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gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg gag aag atc Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile 240 245 250 255	767
ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac att gac ccc Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro 260 265 270	815
ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac acc cgc ttc Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe 275 280 285	863
aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc gat ccc aac Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn 290 295 300	911
ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg atc cgc cgg Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg 305 310 315	959
gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg gac tat agc Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser 320 325 330 335	1007
cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac gag aac ctg Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu 340 345 350	1055
atc ccg gtc ttc cag gag ggg cgg gac atc cac acg gag acc gcc agc Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser 355 360 365	1103
tgg atg ttc ggc gtc ccc ccg gag gcc gtg gac ccc ctg atg cgc cgg Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg 370 375 380	1151
gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg tcg gcc cac Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His 385 390 395	1199
cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc cag gcc ttc Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe 400 405 410 415	1247
att gag cgc tac ttt cag agc ttc ccc aag gtg ccg gcc tgg att gag Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu 420 425 430	1295
aag acc ctg gag gag ggc agg agg ccg ggg tac gtg gag acc ctc ttc Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe 435 440 445	1343
ggc cgc cgc cgc tac gtg cca gac cta gag gcc ccg gtg aag agc gtg Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val 450 455 460	1391
cgg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc cag ggc acc Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr 465 470 475	1439
gcc gcc gac ctc gtg aag ctg gct atg gtg aag ctc ttc ccc agg ctg	1487



Ala Ala Asp Leu Val Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu	
480 485 490 495	
gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac gag ctg gtc	1535
Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val	
500 505 510	
ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg ctg gcc aag	1583
Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys	
515 520 525	
gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg gag gtg gag	1631
Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu	
530 535 540	
gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg gcc gca ctg	1679
Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Leu	
545 550 555	
gtg ccg cgc	1688
Val Pro Arg	
560	
<210> 38	
<211> 562	
<212> PRT	
<213> Thermus aquaticus	
<400> 38	
Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Gly Ser Pro Lys Ala	
1 5 10 15	
Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe	
20 25 30	
Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala	
35 40 45	
Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala	
50 55 60	
Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser	
65 70 75 80	
Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro	
85 90 95	
Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly	
100 105 110	
Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg	
115 120 125	



Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
 130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
 145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
 165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
 180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
 195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
 210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
 225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
 245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
 260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
 275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
 290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
 305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
 325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
 340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
 355 360 365



Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
420 425 430

Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
465 470 475 480

Ala Asp Leu Val Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
545 550 555 560

Pro Arg

<210> 39  
<211> 12  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic peptide

<400> 39



Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Gly  
1 5 10

<210> 40

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic peptide

<400> 40

Ala Ala Ala Leu Val Pro Arg Gly Ser Leu Glu His His His His His  
1 5 10 15

His

<210> 41

<211> 22

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic peptide

<400> 41

Met Lys Tyr Leu Leu Pro Thr Ala Ala Ala Gly Leu Leu Leu Leu Ala  
1 5 10 15

Ala Gln Pro Ala Met Ala  
20

<210> 42

<211> 22

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic peptide

<400> 42

Met Lys Thr Leu Leu Ala Met Val Leu Val Gly Leu Leu Leu Leu Pro  
1 5 10 15

Pro Gly Pro Ser Met Ala  
20

<210> 43

<211> 22

<212> PRT

<213> Artificial Sequence



<220>  
 <223> Description of Artificial Sequence: Synthetic peptide  
 <400> 43  
 Met Arg Gly Leu Leu Ala Met Leu Val Ala Gly Leu Leu Leu Leu Pro  
 1 5 10 15

Ile Ala Pro Ala Met Ala  
 20

<210> 44  
 <211> 22  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic peptide  
 <400> 44  
 Met Arg Arg Leu Leu Val Ile Ala Ala Val Gly Leu Leu Leu Leu Leu  
 1 5 10 15

Ala Pro Pro Thr Met Ala  
 20

<210> 45  
 <211> 33  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic oligonucleotide  
 <400> 45  
 gcggccgcac tgggtgccgcg cggcagcctc gag 33

<210> 46  
 <211> 148  
 <212> PRT  
 <213> Homo sapiens

<400> 46  
 Ala Asp Gln Leu Thr Glu Glu Gln Ile Ala Glu Phe Lys Glu Ala Phe  
 1 5 10 15

Ser Leu Phe Asp Lys Asp Gly Asp Gly Thr Ile Thr Thr Lys Glu Leu  
 20 25 30

Gly Thr Val Met Arg Ser Leu Gly Gln Asn Pro Thr Glu Ala Glu Leu  
 35 40 45

Gln Asp Met Ile Asn Glu Val Asp Ala Asp Gly Asn Gly Thr Ile Asp  
 50 55 60



Phe Pro Glu Phe Leu Thr Met Met Ala Arg Lys Met Lys Asp Thr Asp  
65 70 75 80

Ser Glu Glu Glu Ile Arg Glu Ala Phe Arg Val Phe Asp Lys Asp Gly  
85 90 95

Asn Gly Tyr Ile Ser Ala Ala Glu Leu Arg His Val Met Thr Asn Leu  
100 105 110

Gly Glu Lys Leu Thr Asp Glu Glu Val Asp Glu Met Ile Arg Glu Ala  
115 120 125

Asp Ile Asp Gly Asp Gly Gln Val Asn Tyr Glu Glu Phe Val Gln Met  
130 135 140

Met Thr Ala Lys  
145

<210> 47  
<211> 114  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic polypeptide

<400> 47  
Gln Val Gln Leu Gln Gln Ser Gly Pro Glu Asp Val Lys Pro Gly Ala  
1 5 10 15

Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Asp Tyr  
20 25 30

Tyr Met Asn Trp Val Lys Gln Ser Pro Gly Lys Gly Leu Glu Trp Ile  
35 40 45

Gly Asp Ile Asn Pro Asn Asn Gly Gly Thr Ser Tyr Asn Gln Lys Phe  
50 55 60

Lys Gly Arg Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr  
65 70 75 80

Met Glu Leu Arg Ser Leu Thr Ser Glu Asp Ser Ser Val Tyr Tyr Cys  
85 90 95

Glu Ser Gln Ser Gly Ala Tyr Trp Gly Gln Gly Thr Thr Val Thr Val  
100 105 110



Ser Ala

<210> 48  
<211> 20  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic peptide

<400> 48  
Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly  
1 5 10 15

Gly Gly Gly Ser  
20

<210> 49  
<211> 116  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic polypeptide

<400> 49  
Asp Tyr Lys Asp Ile Leu Met Thr Gln Thr Pro Ser Ser Leu Pro Val  
1 5 10 15

Ser Leu Gly Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile  
20 25 30

Val His Ser Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro  
35 40 45

Gly Gln Ser Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser  
50 55 60

Gly Val Pro Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr  
65 70 75 80

Leu Lys Ile Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys  
85 90 95

Phe Gln Gly Ser His Val Pro Phe Thr Phe Gly Ser Gly Thr Lys Leu  
100 105 110

Glu Ile Lys Arg



115

<210> 50  
<211> 291  
<212> PRT  
<213> *Thermus thermophilus*

<400> 50  
Met Glu Ala Met Leu Pro Leu Phe Glu Pro Lys Gly Arg Val Leu Leu  
1 5 10 15

Val Asp Gly His His Leu Ala Tyr Arg Thr Phe Phe Ala Leu Lys Gly  
20 25 30

Leu Thr Thr Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly Phe Ala  
35 40 45

Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Tyr Lys Ala Val Phe  
50 55 60

Val Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Glu  
65 70 75 80

Ala Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln  
85 90 95

Leu Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Phe Thr Arg Leu  
100 105 110

Glu Val Pro Gly Tyr Glu Ala Asp Asp Val Leu Ala Thr Leu Ala Lys  
115 120 125

Lys Ala Glu Lys Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Arg  
130 135 140

Asp Leu Tyr Gln Leu Val Ser Asp Arg Val Ala Val Leu His Pro Glu  
145 150 155 160

Gly His Leu Ile Thr Pro Glu Trp Leu Trp Glu Lys Tyr Gly Leu Arg  
165 170 175

Pro Glu Gln Trp Val Asp Phe Arg Ala Leu Val Gly Asp Pro Ser Asp  
180 185 190

Asn Leu Pro Gly Val Lys Gly Ile Gly Glu Lys Thr Ala Leu Lys Leu  
195 200 205



Leu Lys Glu Trp Gly Ser Leu Glu Asn Leu Leu Lys Asn Leu Asp Arg  
 210 215 220

Val Lys Pro Glu Asn Val Arg Glu Lys Ile Lys Ala His Leu Glu Asp  
 225 230 235 240

Leu Arg Leu Ser Leu Glu Leu Ser Arg Val Arg Thr Asp Leu Pro Leu  
 245 250 255

Glu Val Asp Leu Ala Gln Gly Arg Glu Pro Asp Arg Glu Gly Leu Arg  
 260 265 270

Ala Phe Leu Glu Arg Leu Glu Phe Gly Ser Leu Leu His Glu Phe Gly  
 275 280 285

Leu Leu Glu  
 290

<210> 51  
 <211> 196  
 <212> PRT  
 <213> Escherichia coli

<400> 51  
 Val Ile Ser Tyr Asp Asn Tyr Val Thr Ile Leu Asp Glu Glu Thr Leu  
 1 5 10 15

Lys Ala Trp Ile Ala Lys Leu Glu Lys Ala Pro Val Phe Ala Phe Asp  
 20 25 30

Thr Glu Thr Asp Ser Leu Asp Asn Ile Ser Ala Asn Leu Val Gly Leu  
 35 40 45

Ser Phe Ala Ile Glu Pro Gly Val Ala Ala Tyr Ile Pro Val Ala His  
 50 55 60

Asp Tyr Leu Asp Ala Pro Asp Gln Ile Ser Arg Glu Arg Ala Leu Glu  
 65 70 75 80

Leu Leu Lys Pro Leu Leu Glu Asp Glu Lys Ala Leu Lys Val Gly Gln  
 85 90 95

Asn Leu Lys Tyr Asp Arg Gly Ile Leu Ala Asn Tyr Gly Ile Glu Leu  
 100 105 110

Arg Gly Ile Ala Phe Asp Thr Met Leu Glu Ser Tyr Ile Leu Asn Ser  
 115 120 125



Val Ala Gly Arg His Asp Met Asp Ser Leu Ala Glu Arg Trp Leu Lys  
 130 135 140

His Lys Thr Ile Thr Phe Glu Glu Ile Ala Gly Lys Gly Lys Asn Gln  
 145 150 155 160

Leu Thr Phe Asn Gln Ile Ala Leu Glu Glu Ala Gly Arg Tyr Ala Ala  
 165 170 175

Glu Asp Ala Asp Val Thr Leu Gln Leu His Leu Lys Met Trp Pro Asp  
 180 185 190

Leu Gln Lys His  
 195

<210> 52  
 <211> 686  
 <212> PRT  
 <213> Bacillus circulans

<400> 52  
 Ala Pro Asp Thr Ser Val Ser Asn Lys Gln Asn Phe Ser Thr Asp Val  
 1 5 10 15

Ile Tyr Gln Ile Phe Thr Asp Arg Phe Ser Asp Gly Asn Pro Ala Asn  
 20 25 30

Asn Pro Thr Gly Ala Ala Phe Asp Gly Thr Cys Thr Asn Leu Arg Leu  
 35 40 45

Tyr Cys Gly Gly Asp Trp Gln Gly Ile Ile Asn Lys Ile Asn Asp Gly  
 50 55 60

Tyr Leu Thr Gly Met Gly Val Thr Ala Ile Trp Ile Ser Gln Pro Val  
 65 70 75 80

Glu Asn Ile Tyr Ser Ile Ile Asn Tyr Ser Gly Val Asn Asn Thr Ala  
 85 90 95

Tyr His Gly Tyr Trp Ala Arg Asp Phe Lys Lys Thr Asn Pro Ala Tyr  
 100 105 110

Gly Thr Ile Ala Asp Phe Gln Asn Leu Ile Ala Ala Ala His Ala Lys  
 115 120 125

Asn Ile Lys Val Ile Ile Asp Phe Ala Pro Asn His Thr Ser Pro Ala  
 130 135 140



Ser Ser Asp Gln Pro Ser Phe Ala Glu Asn Gly Arg Leu Tyr Asp Asn  
 145 150 155 160

Gly Thr Leu Leu Gly Gly Tyr Thr Asn Asp Thr Gln Asn Leu Phe His  
 165 170 175

His Asn Gly Gly Thr Asp Phe Ser Thr Thr Glu Asn Gly Ile Tyr Lys  
 180 185 190

Asn Leu Tyr Asp Leu Ala Asp Leu Asn His Asn Asn Ser Thr Val Asp  
 195 200 205

Val Tyr Leu Lys Asp Ala Ile Lys Met Trp Leu Asp Leu Gly Ile Asp  
 210 215 220

Gly Ile Arg Met Asp Ala Val Lys His Met Pro Phe Gly Trp Gln Lys  
 225 230 235 240

Ser Phe Met Ala Ala Val Asn Asn Tyr Lys Pro Val Phe Thr Phe Gly  
 245 250 255

Glu Trp Phe Leu Gly Val Asn Glu Val Ser Pro Glu Asn His Lys Phe  
 260 265 270

Ala Asn Glu Ser Gly Met Ser Leu Leu Asp Phe Arg Phe Ala Gln Lys  
 275 280 285

Val Arg Gln Val Phe Arg Asp Asn Thr Asp Asn Met Tyr Gly Leu Lys  
 290 295 300

Ala Met Leu Glu Gly Ser Ala Ala Asp Tyr Ala Gln Val Asp Asp Gln  
 305 310 315 320

Val Thr Phe Ile Asp Asn His Asp Met Glu Arg Phe His Ala Ser Asn  
 325 330 335

Ala Asn Arg Arg Lys Leu Glu Gln Ala Leu Ala Phe Thr Leu Thr Ser  
 340 345 350

Arg Gly Val Pro Ala Ile Tyr Tyr Gly Thr Glu Gln Tyr Met Ser Gly  
 355 360 365

Gly Thr Asp Pro Asp Asn Arg Ala Arg Ile Pro Ser Phe Ser Thr Ser  
 370 375 380



Thr Thr Ala Tyr Gln Val Ile Gln Lys Leu Ala Pro Leu Arg Lys Cys  
 385 390 395 400

Asn Pro Ala Ile Ala Tyr Gly Ser Thr Gln Glu Arg Trp Ile Asn Asn  
 405 410 415

Asp Val Leu Ile Tyr Glu Arg Lys Phe Gly Ser Asn Val Ala Val Val  
 420 425 430

Ala Val Asn Arg Asn Leu Asn Ala Pro Ala Ser Ile Ser Gly Leu Val  
 435 440 445

Thr Ser Leu Pro Gln Gly Ser Tyr Asn Asp Val Leu Gly Gly Leu Leu  
 450 455 460

Asn Gly Asn Thr Leu Ser Val Gly Ser Gly Gly Ala Ala Ser Asn Phe  
 465 470 475 480

Thr Leu Ala Ala Gly Gly Thr Ala Val Trp Gln Tyr Thr Ala Ala Thr  
 485 490 495

Ala Thr Pro Thr Ile Gly His Val Gly Pro Met Met Ala Lys Pro Gly  
 500 505 510

Val Thr Ile Thr Ile Asp Gly Arg Gly Phe Gly Ser Ser Lys Gly Thr  
 515 520 525

Val Tyr Phe Gly Thr Thr Ala Val Ser Gly Ala Asp Ile Thr Ser Trp  
 530 535 540

Glu Asp Thr Gln Ile Lys Val Lys Ile Pro Ala Val Ala Gly Gly Asn  
 545 550 555 560

Tyr Asn Ile Lys Val Ala Asn Ala Ala Gly Thr Ala Ser Asn Val Tyr  
 565 570 575

Asp Asn Phe Glu Val Leu Ser Gly Asp Gln Val Ser Val Arg Phe Val  
 580 585 590

Val Asn Asn Ala Thr Thr Ala Leu Gly Gln Asn Val Tyr Leu Thr Gly  
 595 600 605

Ser Val Ser Glu Leu Gly Asn Trp Asp Pro Ala Lys Ala Ile Gly Pro  
 610 615 620



Met Tyr Asn Gln Val Val Tyr Gln Tyr Pro Asn Trp Tyr Tyr Asp Val  
 625 630 635 640

Ser Val Pro Ala Gly Lys Thr Ile Glu Phe Lys Phe Leu Lys Lys Gln  
 645 650 655

Gly Ser Thr Val Thr Trp Glu Gly Gly Ser Asn His Thr Phe Thr Ala  
 660 665 670

Pro Ser Ser Gly Thr Ala Thr Ile Asn Val Asn Trp Gln Pro  
 675 680 685

<210> 53

<211> 399

<212> PRT

<213> Bordetella pertussis

<400> 53

Met Gln Gln Ser His Gln Ala Gly Tyr Ala Asn Ala Ala Asp Arg Glu  
 1 5 10 15

Ser Gly Ile Pro Ala Ala Val Leu Asp Gly Ile Lys Ala Val Ala Lys  
 20 25 30

Glu Lys Asn Ala Thr Leu Met Phe Arg Leu Val Asn Pro His Ser Thr  
 35 40 45

Ser Leu Ile Ala Glu Gly Val Ala Thr Lys Gly Leu Gly Val His Ala  
 50 55 60

Lys Ser Ser Asp Trp Gly Leu Gln Ala Gly Tyr Ile Pro Val Asn Pro  
 65 70 75 80

Asn Leu Ser Lys Leu Phe Gly Arg Ala Pro Glu Val Ile Ala Arg Ala  
 85 90 95

Asp Asn Asp Val Asn Ser Ser Leu Ala His Gly His Thr Ala Val Asp  
 100 105 110

Leu Thr Leu Ser Lys Glu Arg Leu Asp Tyr Leu Arg Gln Ala Gly Leu  
 115 120 125

Val Thr Gly Met Ala Asp Gly Val Val Ala Ser Asn His Ala Gly Tyr  
 130 135 140

Glu Gln Phe Glu Phe Arg Val Lys Glu Thr Ser Asp Gly Arg Tyr Ala  
 145 150 155 160



Val Gln Tyr Arg Arg Lys Gly Gly Asp Asp Phe Glu Ala Val Lys Val  
 165 170 175

Ile Gly Asn Ala Ala Gly Ile Pro Leu Thr Ala Asp Ile Asp Met Phe  
 180 185 190

Ala Ile Met Pro His Leu Ser Asn Phe Arg Asp Ser Ala Arg Ser Ser  
 195 200 205

Val Thr Ser Gly Asp Ser Val Thr Asp Tyr Leu Ala Arg Thr Arg Arg  
 210 215 220

Ala Ala Ser Glu Ala Thr Gly Gly Leu Asp Arg Glu Arg Ile Asp Leu  
 225 230 235 240

Leu Trp Lys Ile Ala Arg Ala Gly Ala Arg Ser Ala Val Gly Thr Glu  
 245 250 255

Ala Arg Arg Gln Phe Arg Tyr Asp Gly Asp Met Asn Ile Gly Val Ile  
 260 265 270

Thr Asp Phe Glu Leu Glu Val Arg Asn Ala Leu Asn Arg Arg Ala His  
 275 280 285

Ala Val Gly Ala Gln Asp Val Val Gln His Gly Thr Glu Gln Asn Asn  
 290 295 300

Pro Phe Pro Glu Ala Asp Glu Lys Ile Phe Val Val Ser Ala Thr Gly  
 305 310 315 320

Glu Ser Gln Met Leu Thr Arg Gly Gln Leu Lys Glu Tyr Ile Gly Gln  
 325 330 335

Gln Arg Gly Glu Gly Tyr Val Phe Tyr Glu Asn Arg Ala Tyr Gly Val  
 340 345 350

Ala Gly Lys Ser Leu Phe Asp Asp Gly Leu Gly Ala Ala Pro Gly Val  
 355 360 365

Pro Ser Gly Arg Ser Lys Phe Ser Pro Asp Val Leu Glu Thr Val Pro  
 370 375 380

Ala Ser Pro Gly Leu Arg Arg Pro Ser Leu Gly Ala Val Glu Arg  
 385 390 395



<210> 54  
 <211> 275  
 <212> PRT  
 <213> Bacillus amyloliquefaciens

<400> 54  
 Ala Gln Ser Val Pro Tyr Gly Val Ser Gln Ile Lys Ala Pro Ala Leu  
 1 5 10 15  
 His Ser Gln Gly Tyr Thr Gly Ser Asn Val Lys Val Ala Val Ile Asp  
 20 25 30  
 Ser Gly Ile Asp Ser Ser His Pro Asp Leu Lys Val Ala Gly Gly Ala  
 35 40 45  
 Ser Met Val Pro Ser Glu Thr Asn Pro Phe Gln Asp Asn Asn Ser His  
 50 55 60  
 Gly Thr His Val Ala Gly Thr Val Ala Ala Leu Asn Asn Ser Ile Gly  
 65 70 75 80  
 Val Leu Gly Val Ala Pro Ser Ala Ser Leu Tyr Ala Val Lys Val Leu  
 85 90 95  
 Gly Ala Asp Gly Ser Gly Gln Tyr Ser Trp Ile Ile Asn Gly Ile Glu  
 100 105 110  
 Trp Ala Ile Ala Asn Asn Met Asp Val Ile Asn Met Ser Leu Gly Gly  
 115 120 125  
 Pro Ser Gly Ser Ala Ala Leu Lys Ala Ala Val Asp Lys Ala Val Ala  
 130 135 140  
 Ser Gly Val Val Val Val Ala Ala Ala Gly Asn Glu Gly Thr Ser Gly  
 145 150 155 160  
 Ser Ser Ser Thr Val Gly Tyr Pro Gly Lys Tyr Pro Ser Val Ile Ala  
 165 170 175  
 Val Gly Ala Val Asp Ser Ser Asn Gln Arg Ala Ser Phe Ser Ser Val  
 180 185 190  
 Gly Pro Glu Leu Asp Val Met Ala Pro Gly Val Ser Ile Gln Ser Thr  
 195 200 205  
 Leu Pro Gly Asn Lys Tyr Gly Ala Tyr Asn Gly Thr Ser Met Ala Ser  
 210 215 220



Pro His Val Ala Gly Ala Ala Ala Leu Ile Leu Ser Lys His Pro Asn  
 225 230 235 240

Trp Thr Asn Thr Gln Val Arg Ser Ser Leu Glu Asn Thr Thr Thr Lys  
 245 250 255

Leu Gly Asp Ser Phe Tyr Tyr Gly Lys Gly Leu Ile Asn Val Gln Ala  
 260 265 270

Ala Ala Gln  
 275

<210> 55

<211> 182

<212> PRT

<213> Bacillus subtilis

<400> 55

Ala Ala Glu His Asn Pro Val Val Met Val His Gly Ile Gly Gly Ala  
 1 5 10 15

Ser Phe Asn Phe Ala Gly Ile Lys Ser Tyr Leu Val Ser Gln Gly Trp  
 20 25 30

Ser Arg Asp Lys Leu Tyr Ala Val Asp Phe Trp Asp Lys Thr Gly Thr  
 35 40 45

Asn Tyr Asn Asn Gly Pro Val Leu Ser Arg Phe Val Gln Lys Val Leu  
 50 55 60

Asp Glu Thr Gly Ala Lys Lys Val Asp Ile Val Ala His Ser Met Gly  
 65 70 75 80

Gly Ala Asn Thr Leu Tyr Tyr Ile Lys Asn Leu Asp Gly Gly Asn Lys  
 85 90 95

Val Ala Asn Val Val Thr Leu Gly Gly Ala Asn Arg Leu Thr Thr Gly  
 100 105 110

Lys Ala Leu Pro Gly Thr Asp Pro Asn Gln Lys Ile Leu Tyr Thr Ser  
 115 120 125

Ile Tyr Ser Ser Ala Asp Met Ile Val Met Asn Tyr Leu Ser Arg Leu  
 130 135 140

Asp Gly Ala Arg Asn Val Gln Ile His Gly Val Gly His Ile Gly Leu  
 145 150 155 160



Leu Tyr Ser Ser Gln Val Asn Ser Leu Ile Lys Glu Gly Leu Asn Gly  
165 170 175

Gly Gly Gln Asn Thr Asn  
180

<210> 56  
<211> 444  
<212> DNA  
<213> Homo sapiens

<400> 56  
gctgaccaac tgactgaaga gcagattgca gaattcaaag aagctttttc actatttgac 60  
aaagatggtg atggaactat aacaacaaag gaattgggaa ctgtaatgag atctcttggg 120  
cagaatccca cagaagcaga gttacaggac atgattaatg aagtagatgc tgatggtaat 180  
ggcacaattg acttccttga atttctgaca atgatggcaa gaaaaatgaa agacacagac 240  
agtgaagaag aaattagaga agcattccgt gtgtttgata aggatggcaa tggctatatt 300  
agtgctgcag aacttcgcca tgtgatgaca aaccttggag agaagttaac agatgaagaa 360  
gttgatgaaa tgatcagga agcagatatt gatggtgatg gtcaagtaaa ctatgaagag 420  
tttgtacaaa tgatgacagc aaag 444

<210> 57  
<211> 2058  
<212> DNA  
<213> Bacillus circulans

<400> 57  
gcgccggata cctcggatc caacaagcaa aatttcagca ccgacgtcat ctatcaaatt 60  
ttcaccgaca ggttttcggg cggcaatccc gccacaatc cgaccggcgc ggcgtttgac 120  
ggaacctgca cgaacctccg gctgtattgc ggcggcgact ggcagggcat catcaacaaa 180  
atcaacgacg gttacctgac cgggatgggc gttaccgcca tctggatctc ccagccggtc 240  
gaaaacatct acagcatcat caattattcc ggcgtaaaca acacggccta tcacggctac 300  
tgggccccggg acttcaagaa gacgaatccg gcctacggca cgattgcgga cttccagaac 360  
ctgatcgccg ccgcgcatgc aaaaaacatc aaagtcatta tcgactttgc cccgaaccat 420  
acgtcgcccc cctcgtccga ccagccttcc tttgcggaaa acggccgggt gtacgataac 480  
ggcacgctgc tcgggggata cacgaacgat acgcagaacc tgttccacca taacggcggc 540  
acggactttt ccacgaccga aaacggcatc tacaaaaacc tgtacgatct cgcgcacctg 600  
aaccataaca acagcacctg ggacgtctac ttgaaggacg cgatcaaaat gtggctggac 660



ctcggcatcg acggcatccg catggatgcg gtgaagcata tgccgttcgg ctggcagaag	720
agcttttatgg ctgccgtcaa caactataag ccggtcttta ccttcggcga atggttcctg	780
ggcgtaaattg aagtgagccc ggaaaaccat aagtttgcca acgaatccgg catgagcctg	840
cttgattttcc gttttgcccc aaaggtgctg caggtgttcc gggacaacac cgacaatatg	900
tacggcctga aggcgatgct ggagggctcc gcagccgatt acgcccaggt ggatgaccag	960
gtgacgttca tcgacaacca tgacatggag cgtttccacg caagcaatgc aaaccgccgg	1020
aagctggagc aagcgcttgc gttcacgctg acctcgcgcg gcgtccccgc catttattac	1080
ggcaccgagc agtacatgtc gggcgggacc gatccggaca accggggcgc gatcccttcc	1140
ttctccacgt cgacgaccgc ctatcaggtc attcaaaagc tggcgccgct gcgcaagtgc	1200
aaccgggcca tcgcctacgg atcgacgcag gagcgctgga tcaacaacga cgtgctcatt	1260
tatgagcgca aattcggcag caacgttgcc gtcggttgccg tcaaccgcaa tttaaaccgcg	1320
ccggcttcca tttcgggact tgtcacttcc ctgccgcaag gcagctacaa cgacgtcctt	1380
ggcggccttc tgaacggcaa cacgttatcg gtaggctccg gcggggccgc ctccaatttc	1440
acgcttgctg ccggcgccac ggcgggtgtg cagtacaccg cggctacggc gacgccgacc	1500
atcgggcatg tcgggcccgat gatggccaag ccgggcgtga cgatcacgat cgacggccgc	1560
ggcttcggct ctagcaaagg caccgtctac ttcggtacga cggcggtgag cggggcggac	1620
atcacgtctt gggaagacac gcagatcaaa gtgaaaattc cggccgtcgc aggcggcaac	1680
tacaacatta aagtgcgaaa cgctgccgga acggcaagca atgtgtatga caacttcgag	1740
gtattgtccg gagaccaggt cagcgctccg ttcgttgtca acaacgcgac gacggccctt	1800
gggcaaaatg tgtacctgac gggcagtgct agcgagctgg ggaactggga cccggcaaaa	1860
gcaatcgggc cgatgtacaa tcaggctcgt taccaatatc cgaactggta ttatgacgtc	1920
agcgttccgg ccggcaaaac gatcgagttc aagtttttga aaaaacaagg ctccaccgtc	1980
acgtgggaag gcggcagcaa ccacaccttc accgcgccgt ccagcggcac cgcgaccatt	2040
aacgtgaatt ggcagcca	2058

<210> 58  
 <211> 1197  
 <212> DNA  
 <213> Bordetella pertussis

<400> 58	
atgcagcaat cgcacagggc tggttacgca aacgccgccg accgggagtc tggcatcccc	60
gcagccgtac tcgatggcat caaggccgtg gcgaaggaaa aaaacgccac attgatgttc	120
cgcttggtca acccccatte caccagcctg attgccgaag gggcggccac caaaggattg	180



ggcgtgcacg ccaagtcgtc cgattggggg ttgcaggcgg gctacattcc cgtcaacccg	240
aatctttcca aactgttcgg ccgtgcgccc gaggtgatcg cgcgggccga caacgacgtc	300
aacagcagcc tggcgcatgg ccataccgcg gtgcacctga cgctgtcgaa agagcggctt	360
gactatctgc ggcaagcggg cctggtcacc ggcattggccg atggcgtggg cgcgagcaac	420
cacgcaggct acgagcagtt cgagtttcgc gtgaaggaaa cctcggacgg gcgctatgcc	480
gtgcagtatc gccgcaaggg cggcgacgat ttcgaggcgg tcaaggatgat cggcaatgcc	540
gccggtattc cactgacggc ggatatcgac atgttcgcca ttatgccgca tctgtccaac	600
ttccgcgact cggcgcgagc ttcgggtgacc agcggcgatt cggtgaccga ttacctggcg	660
cgcacgcggc gggccgccag cgaggccacg ggcggcctgg atcgcgaaac catcgacttg	720
ttgtggaaaa tcgctcgcgc cggcgcccgt tccgcagtgg gcaccgaggc gcgtcgccag	780
ttccgctacg acggcgacat gaatatcggc gtgatcaccg atttcgagct ggaagtgcgc	840
aatgcgctga acaggcgggc gcacgccgtc ggcgcgcagg acgtgggtcca gcatggcact	900
gagcagaaca atcctttccc ggaggcagat gagaagattt tcgtcgtatc ggccaccggt	960
gaaagccaga tgctcacgcg cgggcaactg aaggaataca ttggccagca gcgcggcgag	1020
ggctatgtct tctacgagaa ccgtgcatac ggcgtggcgg ggaaaagcct gttcgacgat	1080
gggctgggag ccgcgcccgg cgtgccgagc ggacgttcga agttctcgcc ggatgtactg	1140
gaaacgggtgc cggcgtcacc cggattgcgg cggccgtcgc tgggcgcagt ggaacgc	1197

<210> 59

<211> 825

<212> DNA

<213> *Bacillus amyloliquefaciens*

<400> 59

gcgcagtccg tgccttacgg cgtatcacia attaaagccc ctgctctgca ctctcaaggc	60
tacactggat caaatgttaa agtagcgggt atcgacagcg gtatcgattc ttctcatcct	120
gatttaaagg tagcaggcgg agccagcatg gttccttctg aaacaaatcc tttccaagac	180
aacaactctc acggaactca cgttgccggc acagttgcgg ctcttaataa ctcaatcggg	240
gtattaggcg ttgcgccaag cgcatactt tacgctgtaa aagttctcgg tgctgacggg	300
tccggccaat acagctggat cattaacgga atcgagtggg cgatcgcaaa caatatggac	360
gttattaaca tgagcctcgg cggaccttct ggttctgctg ctttaaaagc ggcagttgat	420
aaagccgttg catccggcgt cgtagtcgtt gcggcagccg gtaacgaagg cacttcggcg	480
agctcaagca cagtgggcta ccctggtaaa tacccttctg tcattgcagt aggcgctggt	540
gacagcagca accaaagagc atctttctca agcgtaggac ctgagcttga tgtcatggca	600



cctggcgatat ctatccaaag cacgcttcct ggaaacaaat acggggcgta caacgggtacg	660
tcaatggcat ctccgcacgt tgccggagcg gctgctttga ttctttctaa gcacccgaac	720
tggaacaaaca ctcaagtccg cagcagttta gaaaacacca ctacaaaact tgggtgattct	780
ttctactatg gaaaagggt gatcaacgta caggcggcag ctacg	825

<210> 60  
 <211> 873  
 <212> DNA  
 <213> *Thermus thermophilus*

<400> 60	
atggaggcga tgcttcgct ctttgaaccc aaaggccggg tcctcctggt ggacggccac	60
cacctggcct accgcacctt cttcgccctg aagggcctca ccacgagccg gggcgaaccg	120
gtgcaggcgg tctacggctt cgccaagagc ctctcaagg ccctgaagga ggacgggtac	180
aaggccgtct tcgtggtctt tgacgccaag gccccctcct tccgccacga ggcctacgag	240
gcctacaagg cggggagggc cccgaccccc gaggaacttc cccggcagct cgccctcatc	300
aaggagctgg tggacctcct ggggtttacc cgcctcgagg tccccggcta cgaggcggac	360
gacgttctcg ccacctggc caagaaggcg gaaaaggagg ggtacgaggt gcgcatactc	420
accgccgacc gcgacctcta ccaactcgtc tccgaccgag tcgccgtcct ccaccccgag	480
ggccacctca tcaccccgga gtggcttttg gagaagtacg gcctcaggcc ggagcagtgg	540
gtggacttcc gcgccctcgt gggggacccc tccgacaacc tccccggggt caagggcatc	600
ggggagaaga ccgccctcaa gctcctcaag gagtggggaa gcctggaaaa cctcctcaag	660
aacctggacc gggtaaagcc agaaaacgtc cgggagaaga tcaaggccca cctggaagac	720
ctcaggctct ccttgagct ctcccggtg cgcaccgacc tccccctgga ggtggacctc	780
gccagggggc gggagcccga cccggagggg cttagggcct tcctggagag gctggagttc	840
ggcagcctcc tccacgagtt cggcctcctg gag	873

<210> 61  
 <211> 588  
 <212> DNA  
 <213> *Escherichia coli*

<400> 61	
gtgatttctt atgacaacta cgtcaccatc cttgatgaag aaacactgaa agcgtggatt	60
gcgaagctgg aaaaagcgcc ggtatttgca tttgataccg aaaccgacag ccttgataac	120
atctctgcta acctggctgg gctttctttt gctatcgagc caggcgtagc ggcatatatt	180
ccggttgctc atgattatct tgatgcgccc gatcaaactc ctccgagcg tgcactcgag	240
ttgctaaaac cgctgctgga agatgaaaag gcgctgaagg tcgggcaaaa cctgaaatac	300



gatcgcggta ttctggcgaa ctacggcatt gaactgcgtg ggattgcgtt tgataccatg 360  
ctggagtcct acattctcaa tagcgttgcc gggcgtcacg atatggacag cctcgcggaa 420  
cgttggttga agcacaaaac catcactttt gaagagattg ctggtaaagg caaaaatcaa 480  
ctgaccttta accagattgc cctcgaagaa gccggacgtt acgccgccga agatgcagat 540  
gtcaccttgc agttgcatct gaaaatgtgg ccggatctgc aaaaacac 588

<210> 62  
<211> 1637  
<212> DNA  
<213> *Thermus aquaticus*

<220>  
<221> CDS  
<222> (1)..(1635)

<400> 62  
agc ccc aag gcc ctg gag gag gcc ccc tgg ccc ccg ccg gaa ggg gcc 48  
Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala  
1 5 10 15  
ttc gtg ggc ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt 96  
Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
20 25 30  
ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag 144  
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
35 40 45  
cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc 192  
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
50 55 60  
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc 240  
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
65 70 75 80  
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc 288  
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
85 90 95  
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag 336  
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
100 105 110  
gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg 384  
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
115 120 125  
ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg 432  
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
130 135 140  
gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg 480  
Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
145 150 155 160



cgC ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu	528
165 170 175	
gag atc gcc cgC ctc gag gcc gag gtc ttc cgC ctg gcc ggc cac ccc Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro	576
180 185 190	
ttc aac ctc aac tcc cgG gac cag ctg gaa agg gtc ctc ttt gac gag Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu	624
195 200 205	
cta ggg ctt ccc gcc atc ggc aag acg gag aag acc ggc aag cgC tcc Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser	672
210 215 220	
acc agc gcc gcc gtc ctg gag gcc ctc cgC gag gcc cac ccc atc gtg Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val	720
225 230 235 240	
ggg aag atc ctg cag tac cgG gag ctc acc aag ctg aag agc acc tac Gly Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr	768
245 250 255	
att gac ccc ttg ccg gac ctc atc cac ccc agg acg ggc cgC ctc cac Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His	816
260 265 270	
acc cgC ttc aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser	864
275 280 285	
gat ccc aac ctc cag aac atc ccc gtc cgC acc ccg ctt ggg cag agg Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg	912
290 295 300	
atc cgC cgG gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu	960
305 310 315 320	
gat tat agc cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp	1008
325 330 335	
gag aac ctg ata cgG gtc ttc cag gag ggg cgG gac atc cac acg gag Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu	1056
340 345 350	
acc gcc agc tgg atg ttc ggc gtc ccc cgG gag gcc gtg gac ccc ctg Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu	1104
355 360 365	
atg cgC cgG gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met	1152
370 375 380	
tcg gcc cac cgC ctc tcc cag gag cta gcc atc cct tac gag gag gcc Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala	1200
385 390 395 400	



cag gcc ttc ata gag cgc tgc ttt cag agc ttc ccc aag gtg cgg gcc	1248
Gln Ala Phe Ile Glu Arg Cys Phe Gln Ser Phe Pro Lys Val Arg Ala	
405 410 415	
tgg att gag aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag	1296
Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu	
420 425 430	
acc ctc ttc ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg	1344
Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val	
435 440 445	
aag agc gtg cgg gag gcg gca gag cgc atg gcc ttc aac atg ccc gtc	1392
Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val	
450 455 460	
cag ggc acc gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc	1440
Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe	
465 470 475 480	
ccc agg ctg gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac	1488
Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp	
485 490 495	
gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg	1536
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg	
500 505 510	
ctg gtc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg	1584
Leu Val Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu	
515 520 525	
gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg	1632
Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala	
530 535 540	
gcc gc	1637
Ala	
545	

<210> 63  
 <211> 545  
 <212> PRT  
 <213> Thermus aquaticus

<400> 63  
 Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala  
 1 5 10 15

Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
 20 25 30

Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
 35 40 45

Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
 50 55 60



Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
 65 70 75 80

Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
 85 90 95

Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
 100 105 110

Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
 115 120 125

Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
 130 135 140

Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
 145 150 155 160

Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
 165 170 175

Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
 180 185 190

Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
 195 200 205

Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser  
 210 215 220

Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val  
 225 230 235 240

Gly Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr  
 245 250 255

Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His  
 260 265 270

Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser  
 275 280 285

Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg  
 290 295 300



Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu  
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Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp  
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Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu  
 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu  
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Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met  
 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
 385 390 395 400

Gln Ala Phe Ile Glu Arg Cys Phe Gln Ser Phe Pro Lys Val Arg Ala  
 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
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Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val  
 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
 500 505 510

Leu Val Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
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Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
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Ala  
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<212> DNA  
<213> *Thermus aquaticus*

<220>  
<221> CDS  
<222> (1)..(1635)

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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
20 25 30  
  
ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag 144  
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
35 40 45  
  
cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc 192  
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
50 55 60  
  
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc 240  
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
65 70 75 80  
  
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc 288  
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
85 90 95  
  
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag 336  
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
100 105 110  
  
gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg 384  
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
115 120 125  
  
ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg 432  
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
130 135 140  
  
gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg 480  
Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
145 150 155 160  
  
cgc ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag 528  
Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
165 170 175  
  
gag atc gcc cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cgc ccc 576  
Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly Arg Pro  
180 185 190



ttc aac ctc aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu 195 200 205	624
cta ggg ctt ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser 210 215 220	672
acc agc gcc gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val 225 230 235 240	720
gag aag atc ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr 245 250 255	768
att gac ccc ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His 260 265 270	816
acc cgc ttc aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser 275 280 285	864
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atc cgc cgg gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu 305 310 315 320	960
gac tat agc cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp 325 330 335	1008
gag aac ctg atc cgg gtc ttc cag gag ggg cgg gac atc cac acg gag Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu 340 345 350	1056
acc gcc agc tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365	1104
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tcg gcc cac cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400	1200
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tgg att gag aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430	1296



acc ctc ttc ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445	1344
aag agc gtg cgg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val 450 455 460	1392
cag ggc acc gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480	1440
ccc agg ctg gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp 485 490 495	1488
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ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu 515 520 525	1584
gag gtg gag gtg ggg ata ggg gag gac cgg ctc tcc gcc aag gag gcg Glu Val Glu Val Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala 530 535 540	1632
gcc gc Ala 545	1637
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Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu 35 40 45	
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala 50 55 60	
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro 65 70 75 80	
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr 85 90 95	



Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
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Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
 115 120 125

Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
 130 135 140

Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
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Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
 165 170 175

Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly Arg Pro  
 180 185 190

Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
 195 200 205

Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser  
 210 215 220

Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val  
 225 230 235 240

Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr  
 245 250 255

Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His  
 260 265 270

Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser  
 275 280 285

Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg  
 290 295 300

Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu  
 305 310 315 320

Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp  
 325 330 335



Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu  
 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu  
 355 360 365

Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met  
 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
 385 390 395 400

Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala  
 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
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Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
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Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val  
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Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
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Ala  
 545

<210> 66  
 <211> 1637  
 <212> DNA  
 <213> Thermus aquaticus



<220>

<221> CDS

<222> (1)..(1635)

<400> 66

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Phe	Val	Gly	Phe	Val	Leu	Ser	Arg	Lys	Glu	Pro	Met	Trp	Ala	Asp	Leu	
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ctg	gcc	ctg	gcc	gcc	gcc	agg	ggg	ggc	cgg	gtc	cac	cgg	gcc	ccc	gag	144
Leu	Ala	Leu	Ala	Ala	Ala	Arg	Gly	Gly	Arg	Val	His	Arg	Ala	Pro	Glu	
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cct	tat	aaa	gcc	ctc	agg	gac	ctg	aag	gag	gcg	cgg	ggg	ctt	ctc	gcc	192
Pro	Tyr	Lys	Ala	Leu	Arg	Asp	Leu	Lys	Glu	Ala	Arg	Gly	Leu	Leu	Ala	
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Lys	Asp	Leu	Ser	Val	Leu	Ala	Leu	Arg	Glu	Gly	Leu	Gly	Leu	Pro	Pro	
65					70				75					80		
ggc	gac	gac	ccc	atg	ctc	ctc	gcc	tac	ctc	ctg	gac	cct	tcc	aac	acc	288
Gly	Asp	Asp	Pro	Met	Leu	Leu	Ala	Tyr	Leu	Leu	Asp	Pro	Ser	Asn	Thr	
				85					90					95		
acc	ccc	gag	ggg	gtg	gcc	cgg	cgc	tac	ggc	ggg	gag	tgg	acg	gag	gag	336
Thr	Pro	Glu	Gly	Val	Ala	Arg	Arg	Tyr	Gly	Gly	Glu	Trp	Thr	Glu	Glu	
			100					105					110			
gcg	ggg	gag	cgg	gcc	gcc	ctt	tcc	gag	agg	ctc	ttc	gcc	aac	ctg	tgg	384
Ala	Gly	Glu	Arg	Ala	Ala	Leu	Ser	Glu	Arg	Leu	Phe	Ala	Asn	Leu	Trp	
		115					120					125				
ggg	agg	ctt	gag	ggg	gag	gag	agg	ctc	ctt	tgg	ctt	tac	cgg	gag	gtg	432
Gly	Arg	Leu	Glu	Gly	Glu	Glu	Arg	Leu	Leu	Trp	Leu	Tyr	Arg	Glu	Val	
	130					135					140					
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Glu	Arg	Pro	Leu	Ser	Ala	Val	Leu	Ala	His	Met	Glu	Ala	Thr	Gly	Val	
145					150				155					160		
cgc	ctg	gac	gtg	gcc	tat	ctc	agg	gcc	ttg	tcc	ctg	gag	gtg	gcc	gag	528
Arg	Leu	Asp	Val	Ala	Tyr	Leu	Arg	Ala	Leu	Ser	Leu	Glu	Val	Ala	Glu	
			165					170						175		
gag	atc	gcc	cgc	ctc	gag	gcc	gag	gtc	ttc	cgc	ctg	gcc	ggc	cac	ccc	576
Glu	Ile	Ala	Arg	Leu	Glu	Ala	Glu	Val	Phe	Arg	Leu	Ala	Gly	His	Pro	
			180				185						190			
ttc	aac	ctc	aac	tcc	cgg	gac	cag	ctg	gaa	agg	gtc	ctc	ttt	gac	gag	624
Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu	Phe	Asp	Glu	
		195					200					205				
cta	ggg	ctt	ccc	gcc	atc	ggc	aag	acg	gag	aag	acc	ggc	aag	cgc	tcc	672
Leu	Gly	Leu	Pro	Ala	Ile	Gly	Lys	Thr	Glu	Lys	Thr	Gly	Lys	Arg	Ser	
	210					215					220					



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acc gcc agc tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365	1104
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tcg gcc cac cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400	1200
cag gcc ttc att gag cgc tac ttt cag agc ttc ccc aag gtg cgg gcc Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415	1248
tgg att gag aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430	1296
acc ctc ttc ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445	1344
aag agc gtg cgg gag gcg gcc gag cgc aag gcc ttc aac atg ccc gtc Lys Ser Val Arg Glu Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val 450 455 460	1392



cag ggc acc gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480	1440
ccc agg ctg gag gaa atg gag gcc agg atg ctc ctt cag gtc cac gac Pro Arg Leu Glu Glu Met Glu Ala Arg Met Leu Leu Gln Val His Asp 485 490 495	1488
gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gca gtg gcc cgg Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg 500 505 510	1536
ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu 515 520 525	1584
gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala 530 535 540	1632
gcc gc Ala 545	1637
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Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu 35 40 45	
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala 50 55 60	
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro 65 70 75 80	
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr 85 90 95	
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu 100 105 110	
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp 115 120 125	



Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
 130 135 140

Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
 145 150 155 160

Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
 165 170 175

Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
 180 185 190

Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
 195 200 205

Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser  
 210 215 220

Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val  
 225 230 235 240

Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr  
 245 250 255

Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His  
 260 265 270

Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser  
 275 280 285

Asp Pro Asn Leu Gln Asn Ile Pro Ile Arg Thr Pro Leu Gly Gln Arg  
 290 295 300

Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu  
 305 310 315 320

Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp  
 325 330 335

Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Phe His Thr Glu  
 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu  
 355 360 365



Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met  
 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
 385 390 395 400

Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala  
 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
 420 425 430

Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val  
 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465 470 475 480

Pro Arg Leu Glu Glu Met Glu Ala Arg Met Leu Leu Gln Val His Asp  
 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
 500 505 510

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Ala  
 545

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 <212> DNA  
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<220>  
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 <222> (1)..(1635)

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48



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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu	20	25	30	
ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag				144
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu	35	40	45	
cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc				192
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala	50	55	60	
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc				240
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro	65	70	75	80
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc				288
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr	85	90	95	
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag				336
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu	100	105	110	
gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg				384
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp	115	120	125	
ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg				432
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val	130	135	140	
gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg				480
Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val	145	150	155	160
cgc ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag				528
Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu	165	170	175	
gag atc gcc cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc				576
Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro	180	185	190	
ttc aac ctc aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag				624
Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu	195	200	205	
cta ggg ctt ccc gcc atc ggc aag acg gag aag tcc ggc aag cgc tcc				672
Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Ser Gly Lys Arg Ser	210	215	220	
acc agc gcc gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg				720
Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val	225	230	235	240
gag aag atc ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac				768
Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr	245	250	255	



att gac ccc ttg ccg gac cac atc cac ccc agg acg ggc cgc ctc cac Ile Asp Pro Leu Pro Asp His Ile His Pro Arg Thr Gly Arg Leu His 260 265 270	816
acc cgc ttc aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser 275 280 285	864
gat ccc aac ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg 290 295 300	912
atc cgc cgg gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu 305 310 315 320	960
gac tat agc cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp 325 330 335	1008
gag aac ctg atc cgg gtc ttc cag gag ggg cgg gac atc cac acg gag Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu 340 345 350	1056
acc gcc agc tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365	1104
atg cgc cgg gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380	1152
tcg gcc cac cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400	1200
cag gcc ttc att gag cgc tac ttt cag agc ttc ccc aag gtg cgg gcc Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415	1248
tgg att gag aag acc ctg gag gag ggc agg agg cgg ggg tat gtg gag Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430	1296
acc ctc ttc ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445	1344
aag agc gtg cgg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val 450 455 460	1392
cag ggc acc gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480	1440
ccc agg ctg gag gaa atg ggg gcc agg aag ctc ctt cag gtc cac gac Pro Arg Leu Glu Glu Met Gly Ala Arg Lys Leu Leu Gln Val His Asp 485 490 495	1488



gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg 1536  
 Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
                   500                  505                  510

ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg 1584  
 Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
                   515                  520                  525

gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg 1632  
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gcc gc 1637  
 Ala  
 545

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 <213> Thermus aquaticus

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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
                   20                  25                  30

Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
                   35                  40                  45

Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
                   50                  55                  60

Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
 65                  70                  75                  80

Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
                   85                  90                  95

Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
                   100                  105                  110

Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
                   115                  120                  125

Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
                   130                  135                  140

Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
 145                  150                  155                  160



Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
 165 170 175

Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
 180 185 190

Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
 195 200 205

Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Ser Gly Lys Arg Ser  
 210 215 220

Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val  
 225 230 235 240

Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr  
 245 250 255

Ile Asp Pro Leu Pro Asp His Ile His Pro Arg Thr Gly Arg Leu His  
 260 265 270

Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser  
 275 280 285

Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg  
 290 295 300

Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu  
 305 310 315 320

Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp  
 325 330 335

Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu  
 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu  
 355 360 365

Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met  
 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
 385 390 395 400



Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala  
 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
 420 425 430

Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val  
 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Lys Leu Leu Gln Val His Asp  
 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
 500 505 510

Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
 515 520 525

Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
 530 535 540

Ala  
 545

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 <211> 1637  
 <212> DNA  
 <213> Thermus aquaticus

<220>  
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 <222> (1)..(1635)

<400> 70  
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 Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala  
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 Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
 20 25 30

ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag 144  
 Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu



35	40	45	
cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala 50 55 60			192
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro 65 70 75 80			240
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr 85 90 95			288
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu 100 105 110			336
gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp 115 120 125			384
ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val 130 135 140			432
gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val 145 150 155 160			480
cgc ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu 165 170 175			528
gag atc gcc cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro 180 185 190			576
ttc aac ctc aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu 195 200 205			624
cta ggg ctt ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser 210 215 220			672
acc agc gcc gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val 225 230 235 240			720
gag aag atc ctg cgg tac cgg gag ctc acc aag ctg aag agc acc tac Glu Lys Ile Leu Arg Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr 245 250 255			768
att gac ccc ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His 260 265 270			816
acc cgc ttc aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser 275 280 285			864



gat ccc aac ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg 290 295 300	912
atc cgc cgg gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu 305 310 315 320	960
gac tat agc cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp 325 330 335	1008
gag aac ctg atc cgg gtc ttc cag gag ggg cgg gac atc cac acg gag Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu 340 345 350	1056
acc gcc agc tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365	1104
atg cgc cgg gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380	1152
tcg gcc cac cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400	1200
cag gcc ttc att gag cgc tac ttt cag agc ttc ccc aag gtg cgg gcc Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415	1248
tgg att gag aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430	1296
acc ctc ttc ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445	1344
aag agc gtg cgg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val 450 455 460	1392
cag ggc acc gcc gcc gac ctc atg aag ctg act atg gtg aag ctc ttc Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Thr Met Val Lys Leu Phe 465 470 475 480	1440
ccc agg ctg gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp 485 490 495	1488
gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg 500 505 510	1536
ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu 515 520 525	1584



gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg 1632  
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gcc gc 1637  
 Ala  
 545

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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
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Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
 35 40 45

Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
 50 55 60

Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
 65 70 75 80

Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
 85 90 95

Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
 100 105 110

Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
 115 120 125

Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
 130 135 140

Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
 145 150 155 160

Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
 165 170 175

Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
 180 185 190



Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
 195 200 205

Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser  
 210 215 220

Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val  
 225 230 235 240

Glu Lys Ile Leu Arg Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr  
 245 250 255

Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His  
 260 265 270

Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser  
 275 280 285

Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg  
 290 295 300

Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu  
 305 310 315 320

Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp  
 325 330 335

Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu  
 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu  
 355 360 365

Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met  
 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
 385 390 395 400

Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala  
 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
 420 425 430



Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val  
 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Thr Met Val Lys Leu Phe  
 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
 500 505 510

Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
 515 520 525

Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
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Ala  
 545

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 Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
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ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag 144  
 Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
 35 40 45

cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc 192  
 Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
 50 55 60

aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc 240  
 Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro



65	70	75	80	
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc				288
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr	85	90	95	
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag				336
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu	100	105	110	
gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg				384
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp	115	120	125	
ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg				432
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val	130	135	140	
gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg				480
Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val	145	150	155	160
cgc ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag				528
Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu	165	170	175	
gag atc gcc cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc				576
Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro	180	185	190	
ctc aac ctc aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag				624
Leu Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu	195	200	205	
cta ggg ctt ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc				672
Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser	210	215	220	
acc agc gcc gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg				720
Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val	225	230	235	240
gag aag atc ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac				768
Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr	245	250	255	
att gac ccc ttg cca gac ctc atc cac ccc agg acg ggc cgc ctc cac				816
Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His	260	265	270	
acc cgc ttc aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc				864
Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser	275	280	285	
gat ccc aac ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg				912
Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg	290	295	300	
atc cgc cgg gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg				960
Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu	305	310	315	320



gac tat agc cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp 325 330 335	1008
gag aac ctg atc cgg gtc ttc cag gag ggg cgg gac atc cac acg gag Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu 340 345 350	1056
acc gcc agc tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365	1104
atg cgc cgg gcg gcc aag gcc atc aac ttc ggg gtc ctc tac ggc atg Met Arg Arg Ala Ala Lys Ala Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380	1152
tca gcc cac cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400	1200
cag gcc ttc att gag cgc tac ttt cag agc ttc ccc aag gtg cgg gcc Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415	1248
tgg att gag aag acc ctg gag gag ggc agg aga cgg ggg tac gtg gag Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430	1296
acc ctc ttc ggc cgc cgc cgc tat gtg cct gac cta gag gcc cgg gtg Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445	1344
aag agc gtg cgg gag gcg gcc gag cgc atg gcc tac aac atg ccc gtc Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Tyr Asn Met Pro Val 450 455 460	1392
cag ggc acc gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480	1440
acc agg ctg gag gaa acg ggg gcc agg atg ctc ctt cag gtc cac gac Thr Arg Leu Glu Glu Thr Gly Ala Arg Met Leu Leu Gln Val His Asp 485 490 495	1488
gag ctg gtc ctc gag gcc cct aaa gag ggg gcg gag gcc gtg gcc cgg Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg 500 505 510	1536
ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu 515 520 525	1584
gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala 530 535 540	1632
gcc gc Ala 545	1637



<210> 73  
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 <212> PRT  
 <213> Thermus aquaticus

<400> 73  
 Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala  
 1 5 10 15  
 Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
 20 25 30  
 Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
 35 40 45  
 Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
 50 55 60  
 Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
 65 70 75 80  
 Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
 85 90 95  
 Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
 100 105 110  
 Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
 115 120 125  
 Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
 130 135 140  
 Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
 145 150 155 160  
 Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
 165 170 175  
 Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
 180 185 190  
 Leu Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
 195 200 205  
 Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser  
 210 215 220



Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val  
 225 230 235 240

Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr  
 245 250 255

Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His  
 260 265 270

Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser  
 275 280 285

Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg  
 290 295 300

Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu  
 305 310 315 320

Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp  
 325 330 335

Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu  
 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu  
 355 360 365

Met Arg Arg Ala Ala Lys Ala Ile Asn Phe Gly Val Leu Tyr Gly Met  
 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
 385 390 395 400

Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala  
 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
 420 425 430

Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Tyr Asn Met Pro Val  
 450 455 460



Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465 470 475 480

Thr Arg Leu Glu Glu Thr Gly Ala Arg Met Leu Leu Gln Val His Asp  
 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
 500 505 510

Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
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Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
 530 535 540

Ala  
 545

<210> 74  
 <211> 1637  
 <212> DNA  
 <213> *Thermus aquaticus*

<220>  
 <221> CDS  
 <222> (1)..(1635)

<400> 74  
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 Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
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 ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag 144  
 Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
 35 40 45  
 cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc 192  
 Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
 50 55 60  
 aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc 240  
 Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
 65 70 75 80  
 ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc 288  
 Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
 85 90 95  
 acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag 336  
 Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu



100										105										110										
gcg	ggg	gag	cgg	gcc	gcc	ctt	tcc	gag	agg	ctc	ttc	gcc	aac	ctg	tgg	384														
Ala	Gly	Glu	Arg	Ala	Ala	Leu	Ser	Glu	Arg	Leu	Phe	Ala	Asn	Leu	Trp															
		115						120					125																	
ggg	agg	ctt	gag	ggg	gag	gag	agg	ctc	ctt	tgg	ctt	tac	cgg	gag	gtg	432														
Gly	Arg	Leu	Glu	Gly	Glu	Glu	Arg	Leu	Leu	Trp	Leu	Tyr	Arg	Glu	Val															
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gag	agg	ccc	ctt	tcc	gct	gtc	ctg	gcc	cac	atg	gag	gcc	acg	ggg	gtg	480														
Glu	Arg	Pro	Leu	Ser	Ala	Val	Leu	Ala	His	Met	Glu	Ala	Thr	Gly	Val															
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cgc	ctg	gac	gtg	gcc	tat	ctc	agg	gcc	ttg	tcc	ctg	gag	gtg	gcc	gag	528														
Arg	Leu	Asp	Val	Ala	Tyr	Leu	Arg	Ala	Leu	Ser	Leu	Glu	Val	Ala	Glu															
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gag	atc	gcc	cgc	ctc	gag	gcc	gag	gtc	ttc	cgc	ctg	gcc	ggc	cac	ccc	576														
Glu	Ile	Ala	Arg	Leu	Glu	Ala	Glu	Val	Phe	Arg	Leu	Ala	Gly	His	Pro															
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ttc	aac	ctc	aac	tcc	cgg	gac	cag	ctg	gaa	agg	gtc	ctc	ttt	gac	gag	624														
Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu	Phe	Asp	Glu															
		195					200					205																		
cta	ggg	ctt	ccc	gcc	atc	ggc	aag	acg	gag	aag	acc	ggc	aag	cgc	tcc	672														
Leu	Gly	Leu	Pro	Ala	Ile	Gly	Lys	Thr	Glu	Lys	Thr	Gly	Lys	Arg	Ser															
		210				215					220																			
acc	agc	gcc	gcc	gtc	ctg	gag	gcc	ctc	cgc	gag	gcc	cac	ccc	atc	gtg	720														
Thr	Ser	Ala	Ala	Val	Leu	Glu	Ala	Leu	Arg	Glu	Ala	His	Pro	Ile	Val															
		225			230					235					240															
gag	aag	atc	ctg	cag	tac	cgg	gag	ctc	acc	aag	ctg	aag	agc	acc	tac	768														
Glu	Lys	Ile	Leu	Gln	Tyr	Arg	Glu	Leu	Thr	Lys	Leu	Lys	Ser	Thr	Tyr															
				245					250					255																
att	gac	ccc	ttg	cgc	gac	ccc	atc	cac	ccc	agg	acg	ggc	cgc	ctc	cac	816														
Ile	Asp	Pro	Leu	Pro	Asp	Pro	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu	His															
			260					265					270																	
acc	cgc	ttc	aac	cag	acg	gcc	acg	gcc	acg	ggc	agg	cta	agt	agc	tcc	864														
Thr	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser	Ser															
		275					280					285																		
gat	ccc	aac	ctc	cag	aac	atc	ccc	gtc	cgc	acc	ccg	ctt	ggg	cag	agg	912														
Asp	Pro	Asn	Leu	Gln	Asn	Ile	Pro	Val	Arg	Thr	Pro	Leu	Gly	Gln	Arg															
		290				295					300																			
atc	cgc	cgg	gcc	ttc	atc	gcc	gag	gag	ggg	tgg	cta	ttg	gtg	gcc	ctg	960														
Ile	Arg	Arg	Ala	Phe	Ile	Ala	Glu	Glu	Gly	Trp	Leu	Leu	Val	Ala	Leu															
		305			310					315					320															
gac	tat	agc	cag	ata	gag	ctc	agg	gtg	ctg	gcc	cac	ctc	tcc	ggc	gac	1008														
Asp	Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Leu	Ser	Gly	Asp															
				325					330					335																
gag	aac	ctg	atc	cgg	gtc	ttc	cag	gag	ggg	cgg	gac	atc	cac	acg	gag	1056														
Glu	Asn	Leu	Ile	Arg	Val	Phe	Gln	Glu	Gly	Arg	Asp	Ile	His	Thr	Glu															
			340					345					350																	



acc gcc agc tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365	1104
atg cgc cgg acg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg Met Arg Arg Thr Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380	1152
tcg gcc cac cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400	1200
cag gcc ttc att gag cgc tac ttt cag agc ttc ccc aag gtg cgg gcc Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415	1248
tgg att gag aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430	1296
acc ctc ttc ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445	1344
aag agc gtg cgg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val 450 455 460	1392
cag ggc acc gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480	1440
ccc agg ctg gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp 485 490 495	1488
gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gtc cgg Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Val Arg 500 505 510	1536
ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu 515 520 525	1584
gag gtg aag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg Glu Val Lys Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala 530 535 540	1632
gcc gc Ala 545	1637

<210> 75  
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 <212> PRT  
 <213> Thermus aquaticus

<400> 75  
 Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala



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Leu Ala Leu	Ala Ala Ala Arg Gly Gly Arg Val His Arg	Ala Pro Glu	
35	40	45	
Pro Tyr Lys	Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly	Leu Leu Ala	
50	55	60	
Lys Asp Leu	Ser Val Leu Ala Leu Arg Glu Gly Leu Gly	Leu Pro Pro	
65	70	75	80
Gly Asp Asp	Pro Met Leu Leu Ala Tyr Leu Leu Asp	Pro Ser Asn Thr	
	85	90	95
Thr Pro Glu	Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp	Thr Glu Glu	
100	105	110	
Ala Gly Glu	Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala	Asn Leu Trp	
115	120	125	
Gly Arg Leu	Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr	Arg Glu Val	
130	135	140	
Glu Arg Pro	Leu Ser Ala Val Leu Ala His Met Glu Ala	Thr Gly Val	
145	150	155	160
Arg Leu Asp	Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu	Val Ala Glu	
	165	170	175
Glu Ile Ala	Arg Leu Glu Ala Glu Val Phe Arg Leu Ala	Gly His Pro	
180	185	190	
Phe Asn Leu	Asn Ser Arg Asp Gln Leu Glu Arg Val Leu	Phe Asp Glu	
195	200	205	
Leu Gly Leu	Pro Ala Ile Gly Lys Thr Glu Lys Thr	Gly Lys Arg Ser	
210	215	220	
Thr Ser Ala	Ala Val Leu Glu Ala Leu Arg Glu Ala His	Pro Ile Val	
225	230	235	240
Glu Lys Ile	Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys	Ser Thr Tyr	
	245	250	255



Ile Asp Pro Leu Pro Asp Pro Ile His Pro Arg Thr Gly Arg Leu His  
 260 265 270

Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser  
 275 280 285

Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg  
 290 295 300

Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu  
 305 310 315 320

Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp  
 325 330 335

Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu  
 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu  
 355 360 365

Met Arg Arg Thr Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met  
 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
 385 390 395 400

Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala  
 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
 420 425 430

Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val  
 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
 485 490 495



Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Val Arg  
500 505 510

Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
515 520 525

Glu Val Lys Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
530 535 540

Ala  
545

<210> 76  
<211> 1637  
<212> DNA  
<213> *Thermus aquaticus*

<220>  
<221> CDS  
<222> (1)..(1635)

<400> 76  
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ttc gtg ggc ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt 96  
Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
20 25 30  
ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag 144  
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
35 40 45  
cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc 192  
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
50 55 60  
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc 240  
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
65 70 75 80  
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc 288  
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
85 90 95  
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag 336  
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
100 105 110  
gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg 384  
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
115 120 125  
ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg 432  
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val



130	135	140	
gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val 145 150 155 160			480
cgc ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu 165 170 175			528
gag atc gcc cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro 180 185 190			576
ttc aac ctc aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu 195 200 205			624
cta ggg ctt ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser 210 215 220			672
acc agc gcc gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val 225 230 235 240			720
gag aag atc ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr 245 250 255			768
att gac ccc ttg ccg gac ctc ttc cac ccc agg acg ggc cgc ctc cac Ile Asp Pro Leu Pro Asp Leu Phe His Pro Arg Thr Gly Arg Leu His 260 265 270			816
acc cgc ttc aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser 275 280 285			864
gat ccc aac ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg 290 295 300			912
atc cgc cgg gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gtc ctg Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Val Leu 305 310 315 320			960
gac tat agt cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp 325 330 335			1008
gag aac ctg atc cgg gtc ttc cag gag ggg cgg gac atc cac acg gag Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu 340 345 350			1056
acc gcc agc tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365			1104
atg cgc cgg gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380			1152



tcg gcc cac cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc	1200
Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala	
385 390 395 400	
cag gcc ttc att gag cgc tac ttt cag agc ttc ccc aag gtg cgg gcc	1248
Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala	
405 410 415	
tgg att gag aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag	1296
Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu	
420 425 430	
acc ctc ttc ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg	1344
Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val	
435 440 445	
aag agc gtg cgg gag gcg gcc gag cgc atg gcc tcc aac atg ccc gtc	1392
Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Ser Asn Met Pro Val	
450 455 460	
cag ggc acc gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc	1440
Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe	
465 470 475 480	
ccc agg ctg gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac	1488
Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp	
485 490 495	
gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg	1536
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg	
500 505 510	
ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg	1584
Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu	
515 520 525	
gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg	1632
Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala	
530 535 540	
gcc gc	1637
Ala	
545	

<210> 77  
 <211> 545  
 <212> PRT  
 <213> Thermus aquaticus

<400> 77  
 Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala  
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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
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Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu



35	40	45																	
Pro	Tyr	Lys	Ala	Leu	Arg	Asp	Leu	Lys	Glu	Ala	Arg	Gly	Leu	Leu	Ala				
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Lys	Asp	Leu	Ser	Val	Leu	Ala	Leu	Arg	Glu	Gly	Leu	Gly	Leu	Pro	Pro				
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Gly	Asp	Asp	Pro	Met	Leu	Leu	Ala	Tyr	Leu	Leu	Asp	Pro	Ser	Asn	Thr				
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Thr	Pro	Glu	Gly	Val	Ala	Arg	Arg	Tyr	Gly	Gly	Glu	Trp	Thr	Glu	Glu				
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Ala	Gly	Glu	Arg	Ala	Ala	Leu	Ser	Glu	Arg	Leu	Phe	Ala	Asn	Leu	Trp				
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Gly	Arg	Leu	Glu	Gly	Glu	Arg	Leu	Leu	Trp	Leu	Tyr	Arg	Glu	Val					
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Glu	Arg	Pro	Leu	Ser	Ala	Val	Leu	Ala	His	Met	Glu	Ala	Thr	Gly	Val				
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Arg	Leu	Asp	Val	Ala	Tyr	Leu	Arg	Ala	Leu	Ser	Leu	Glu	Val	Ala	Glu				
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Glu	Ile	Ala	Arg	Leu	Glu	Ala	Glu	Val	Phe	Arg	Leu	Ala	Gly	His	Pro				
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Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu	Phe	Asp	Glu				
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Leu	Gly	Leu	Pro	Ala	Ile	Gly	Lys	Thr	Glu	Lys	Thr	Gly	Lys	Arg	Ser				
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Thr	Ser	Ala	Ala	Val	Leu	Glu	Ala	Leu	Arg	Glu	Ala	His	Pro	Ile	Val				
225					230					235				240					
Glu	Lys	Ile	Leu	Gln	Tyr	Arg	Glu	Leu	Thr	Lys	Leu	Lys	Ser	Thr	Tyr				
				245					250					255					
Ile	Asp	Pro	Leu	Pro	Asp	Leu	Phe	His	Pro	Arg	Thr	Gly	Arg	Leu	His				
			260					265					270						
Thr	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser	Ser				
	275						280					285							



Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg  
 290 295 300

Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Val Leu  
 305 310 315 320

Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp  
 325 330 335

Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu  
 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu  
 355 360 365

Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met  
 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
 385 390 395 400

Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala  
 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
 420 425 430

Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Ser Asn Met Pro Val  
 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
 500 505 510

Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
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Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
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Ala  
545

<210> 78  
<211> 1637  
<212> DNA  
<213> *Thermus aquaticus*

<220>  
<221> CDS  
<222> (1) .. (1635)

<400> 78  
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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
20 25 30  
ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag 144  
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
35 40 45  
cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc 192  
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
50 55 60  
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc 240  
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
65 70 75 80  
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc 288  
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
85 90 95  
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag 336  
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
100 105 110  
gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg 384  
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
115 120 125  
ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg 432  
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
130 135 140  
gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg 480  
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Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu



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Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu	Phe	Asp	Glu					
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cta	ggg	ctt	ccc	gcc	atc	ggc	aag	acg	gag	aag	acc	ggc	aag	cgc	tcc	672				
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225					230					235					240					
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Glu	Lys	Ile	Leu	Gln	Tyr	Arg	Glu	Leu	Thr	Lys	Leu	Lys	Ser	Thr	Tyr					
245					250					255										
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Ile	Asp	Pro	Leu	Pro	Asp	Leu	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu	His					
260					265					270										
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atc	cgc	cgg	gcc	ttc	atc	gcc	gag	gag	ggg	tgg	cta	ttg	gtg	gcc	ctg	960				
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gac	tat	agc	cag	ata	gag	ctc	agg	gtg	ctg	gcc	cac	ctc	tcc	ggc	gac	1008				
Asp	Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Leu	Ser	Gly	Asp					
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gag	aac	ctg	atc	cgg	gtc	ttc	cag	gag	ggg	cgg	gac	atc	cac	acg	gag	1056				
Glu	Asn	Leu	Ile	Arg	Val	Phe	Gln	Glu	Gly	Arg	Asp	Ile	His	Thr	Glu					
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acc	gcc	agc	tgg	atg	ttc	ggc	gtc	ccc	cga	gag	gcc	gtg	gac	ccc	ctg	1104				
Thr	Ala	Ser	Trp	Met	Phe	Gly	Val	Pro	Arg	Glu	Ala	Val	Asp	Pro	Leu					
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Met	Arg	Arg	Ala	Ala	Lys	Thr	Ile	Asn	Phe	Gly	Val	Leu	Tyr	Gly	Met					
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tcg	gcc	cac	cgc	ctc	tcc	cag	gag	cta	gcc	atc	cct	tac	gag	gag	gcc	1200				
Ser	Ala	His	Arg	Leu	Ser	Gln	Glu	Leu	Ala	Ile	Pro	Tyr	Glu	Glu	Ala					
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cag	gcc	ttc	att	gag	cgc	tac	ttt	cag	agc	ttc	ccc	aag	gtg	cgg	gcc	1248				
Gln	Ala	Phe	Ile	Glu	Arg	Tyr	Phe	Gln	Ser	Phe	Pro	Lys	Val	Arg	Ala					
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tgg att gag aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag	1296
Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu	
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acc ctc ttc ggt cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg	1344
Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val	
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aag agc gtg cgg aag gcg gcc gag cgc aag gcc ttc aac atg ccc gtc	1392
Lys Ser Val Arg Lys Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val	
450 455 460	
cag ggc acc gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc	1440
Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe	
465 470 475 480	
ccc agg ctg gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac	1488
Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp	
485 490 495	
gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg	1536
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg	
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ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg	1584
Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu	
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Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala	
50 55 60	
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro	



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Ala	Gly	Glu	Arg	Ala	Ala	Leu	Ser	Glu	Arg	Leu	Phe	Ala	Asn	Leu	Trp
		115					120					125			
Gly	Arg	Leu	Glu	Gly	Glu	Glu	Arg	Leu	Leu	Trp	Leu	Tyr	Arg	Glu	Val
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Glu	Arg	Pro	Leu	Ser	Ala	Val	Leu	Ala	His	Met	Glu	Ala	Thr	Gly	Val
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Arg	Leu	Asp	Val	Ala	Tyr	Leu	Arg	Ala	Leu	Ser	Leu	Glu	Val	Ala	Glu
				165					170					175	
Glu	Ile	Ala	Arg	Leu	Glu	Ala	Glu	Val	Phe	Arg	Leu	Ala	Gly	His	Pro
			180					185					190		
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Leu	Gly	Leu	Pro	Ala	Ile	Gly	Lys	Thr	Glu	Lys	Thr	Gly	Lys	Arg	Ser
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Thr	Ser	Ala	Ala	Val	Leu	Glu	Ala	Leu	Arg	Glu	Ala	His	Pro	Ile	Val
225					230					235					240
Glu	Lys	Ile	Leu	Gln	Tyr	Arg	Glu	Leu	Thr	Lys	Leu	Lys	Ser	Thr	Tyr
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Ile	Asp	Pro	Leu	Pro	Asp	Leu	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu	His
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		275					280					285			
Asp	Pro	Asn	Leu	Gln	Asn	Ile	Pro	Val	Arg	Thr	Pro	Leu	Gly	Gln	Arg
	290					295					300				
Ile	Arg	Arg	Ala	Phe	Ile	Ala	Glu	Glu	Gly	Trp	Leu	Leu	Val	Ala	Leu
305					310					315					320



Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp  
 325 330 335

Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu  
 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu  
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Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met  
 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
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Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala  
 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
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Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
 435 440 445

Lys Ser Val Arg Lys Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val  
 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
 500 505 510

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Ala  
 545



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<220>  
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 <222> (1)..(1635)

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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu
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ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag      144
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu
          35          40          45

cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc      192
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala
          50          55          60

aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc      240
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro
65          70          75          80

ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc      288
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr
          85          90          95

acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag      336
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu
          100          105          110

gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg      384
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp
          115          120          125

ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg      432
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val
          130          135          140

gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg      480
Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val
145          150          155          160

cgc ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag      528
Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu
          165          170          175

gag atc gcc cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc      576
Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro
          180          185          190

ttc aac ctc aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag      624
Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu

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195	200	205	
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gag aag atc ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr 245 250 255			768
att gac ccc ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His 260 265 270			816
acc cgc ttc aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser 275 280 285			864
gat ccc aac ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg 290 295 300			912
atc cgc cgg gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu 305 310 315 320			960
gac tat agc cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp 325 330 335			1008
gag aac ctg atc cgg gtc ttc cag gag ggg cgg gac atc cac acg gag Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu 340 345 350			1056
acc gcc agc tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365			1104
atg cgc cgg gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380			1152
tcg gcc cac cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400			1200
cag gcc ttc att gag cgc tac ttt cag agc ttc ccc aag gtg cgg gcc Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415			1248
tgg att gag aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430			1296
acc ctc ttc ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445			1344



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ccc agg ctg gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp 485 490 495	1488
gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg 500 505 510	1536
ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu 515 520 525	1584
gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala 530 535 540	1632
gcc gc Ala 545	1637

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Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
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Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
 50 55 60

Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
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Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
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Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu



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Gly	Arg	Leu	Glu	Gly	Glu	Glu	Arg	Leu	Leu	Trp	Leu	Tyr	Arg	Glu	Val
		130					135					140			
Glu	Arg	Pro	Leu	Ser	Ala	Val	Leu	Ala	His	Met	Glu	Ala	Thr	Gly	Val
							150					155			160
Arg	Leu	Asp	Val	Ala	Tyr	Leu	Arg	Ala	Leu	Ser	Leu	Glu	Val	Ala	Glu
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Glu	Ile	Ala	Arg	Leu	Glu	Ala	Glu	Val	Phe	Arg	Leu	Ala	Gly	His	Pro
			180					185					190		
Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu	Phe	Asp	Glu
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Leu	Gly	Leu	Pro	Ala	Ile	Gly	Lys	Thr	Glu	Lys	Thr	Gly	Lys	Arg	Ser
			210				215					220			
Thr	Ser	Ala	Ala	Val	Leu	Glu	Ala	Leu	Arg	Glu	Ala	His	Pro	Ile	Val
							230					235			240
Glu	Lys	Ile	Leu	Gln	Tyr	Arg	Glu	Leu	Thr	Lys	Leu	Lys	Ser	Thr	Tyr
				245					250					255	
Ile	Asp	Pro	Leu	Pro	Asp	Leu	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu	His
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Thr	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser	Ser
							280					285			
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Asp	Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Leu	Ser	Gly	Asp
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Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu  
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Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met  
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Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
 385 390 395 400

Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala  
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Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
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Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
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Lys Ser Val Arg Glu Ala Ala Glu Arg Arg Ala Phe Asn Met Pro Val  
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Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
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Ala  
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<222> (1)..(1635)

<400> 82

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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu	
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ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag	144
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu	
35 40 45	
cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc	192
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala	
50 55 60	
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc	240
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro	
65 70 75 80	
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc	288
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr	
85 90 95	
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag	336
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu	
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gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg	384
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp	
115 120 125	
ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg	432
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val	
130 135 140	
gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg	480
Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val	
145 150 155 160	
cgc ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag	528
Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu	
165 170 175	
gag atc gcc cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc	576
Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro	
180 185 190	
ttc aac ctc aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag	624
Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu	
195 200 205	
cta ggg ctt ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc	672
Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser	
210 215 220	
acc agc gcc gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg	720
Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val	



225	230	235	240	
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Glu Lys Ile Leu	Gln Tyr Arg Glu Leu	Thr Lys Leu Lys Ser Thr Tyr		
	245	250	255	
att gac ccc ttg	cgg gac ctc atc cac	ccc agg acg ggc cgc ctc cac		816
Ile Asp Pro Leu	Pro Asp Leu Ile His	Pro Arg Thr Gly Arg Leu His		
	260	265	270	
acc cgc ttc aac cag	acg gcc acg gcc	acg ggc agg cta agt agc tcc		864
Thr Arg Phe Asn Gln	Thr Ala Thr Ala	Thr Gly Arg Leu Ser Ser Ser		
	275	280	285	
gat ccc aac ctc cag	aac atc ccc gtc cgc	acc ccg ctt ggg cag agg		912
Asp Pro Asn Leu Gln	Asn Ile Pro Val Arg	Thr Pro Leu Gly Gln Arg		
	290	295	300	
atc cgc cgg gcc ttc	atc gcc gag gag ggg	tgg cta ttg gtg gtc ctg		960
Ile Arg Arg Ala Phe	Ile Ala Glu Glu Gly	Trp Leu Leu Val Val Leu		
	305	310	315	320
gac tat agc cag ata	gag ctc agg gtg ctg	gcc cac ctc tcc ggc gac		1008
Asp Tyr Ser Gln Ile	Glu Leu Arg Val Leu	Ala His Leu Ser Gly Asp		
	325	330	335	
gag aac ctg atc cgg	gtc ttc cag gag ggg	cgg gac atc cac acg gag		1056
Glu Asn Leu Ile Arg	Val Phe Gln Glu Gly	Arg Asp Ile His Thr Glu		
	340	345	350	
acc gcc agc tgg atg	ttc ggc gtc ccc cgg	gag gcc gtg gac ccc ctg		1104
Thr Ala Ser Trp Met	Phe Gly Val Pro Arg	Glu Ala Val Asp Pro Leu		
	355	360	365	
atg cgc cgg gcg gcc	aag acc atc aac ttc	ggg gtc ctc tac ggc atg		1152
Met Arg Arg Ala Ala	Lys Thr Ile Asn Phe	Gly Val Leu Tyr Gly Met		
	370	375	380	
tcg gcc cac cgc ctc	tcc cag gag cta gcc	atc cct tac gag gag gcc		1200
Ser Ala His Arg Leu	Ser Gln Glu Leu Ala	Ile Pro Tyr Glu Glu Ala		
	385	390	395	400
cag gcc ttc att gag	cgc tac ttt cag agc	ttc ccc aag gtg cgg gcc		1248
Gln Ala Phe Ile Glu	Arg Tyr Phe Gln Ser	Phe Pro Lys Val Arg Ala		
	405	410	415	
tgg att gag aag acc	ctg gag gag ggc agg	agg cgg ggg tac gtg gag		1296
Trp Ile Glu Lys Thr	Leu Glu Glu Gly Arg	Arg Arg Arg Gly Tyr Val Glu		
	420	425	430	
acc ctc ttc ggc cgc	cgc cgc cgc tac gtg	cca gac cta gag gcc cgg		1344
Thr Leu Phe Gly Arg	Arg Arg Arg Tyr Val	Pro Asp Leu Glu Ala Arg Val		
	435	440	445	
aag agc gtg cgg gag	gcg gcc gag cgc atg	gcc ttc aac atg ccc gtc		1392
Lys Ser Val Arg Glu	Ala Ala Glu Arg Met	Ala Phe Asn Met Pro Val		
	450	455	460	
cag ggc acc gcc gcc	gac ctc atg aag ctg	gct atg gtg aag ctc ttc		1440
Gln Gly Thr Ala Ala	Asp Leu Met Lys Leu	Ala Met Val Lys Leu Phe		
	465	470	475	480



ccc agg ctg gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac 1488  
Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
485 490 495

gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg 1536  
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
500 505 510

ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg 1584  
Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
515 520 525

gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg 1632  
Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
530 535 540

gcc gc 1637  
Ala  
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<213> Thermus aquaticus

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Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
35 40 45

Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
50 55 60

Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
65 70 75 80

Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
85 90 95

Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
100 105 110

Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
115 120 125

Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val



130		135		140
Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val				
145		150	155	160
Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu				
	165		170	175
Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro				
	180		185	190
Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu				
	195		200	205
Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser				
	210		215	220
Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val				
225		230	235	240
Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr				
	245		250	255
Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His				
	260		265	270
Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser				
	275		280	285
Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg				
	290		295	300
Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Val Leu				
305		310	315	320
Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp				
	325		330	335
Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu				
	340		345	350
Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu				
	355		360	365
Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met				
	370		375	380



Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
 385 390 395 400

Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala  
 405 410 415

Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
 420 425 430

Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
 435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val  
 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
 500 505 510

Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
 515 520 525

Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
 530 535 540

Ala  
 545

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 Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala  
 1 5 10 15

ttc gtg ggc ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt 96



Phe	Val	Gly	Phe	Val	Leu	Ser	Arg	Lys	Glu	Pro	Met	Trp	Ala	Asp	Leu		
			20					25					30				
ctg	gcc	ctg	gcc	gcc	gcc	agg	ggg	ggc	cgg	gtc	cac	cgg	gcc	ccc	gag	144	
Leu	Ala	Leu	Ala	Ala	Ala	Arg	Gly	Gly	Arg	Val	His	Arg	Ala	Pro	Glu		
		35					40					45					
cct	tat	aaa	gcc	ctc	agg	gac	ctg	aag	gag	gcg	cgg	ggg	ctt	ctc	gcc	192	
Pro	Tyr	Lys	Ala	Leu	Arg	Asp	Leu	Lys	Glu	Ala	Arg	Gly	Leu	Leu	Ala		
	50					55					60						
aaa	gac	ctg	agc	gtt	ctg	gcc	ctg	agg	gaa	ggc	ctt	ggc	ctc	ccg	ccc	240	
Lys	Asp	Leu	Ser	Val	Leu	Ala	Leu	Arg	Glu	Gly	Leu	Gly	Leu	Pro	Pro		
65					70					75					80		
ggc	gac	gac	ccc	atg	ctc	ctc	gcc	tac	ctc	ctg	gac	cct	tcc	aac	acc	288	
Gly	Asp	Asp	Pro	Met	Leu	Leu	Ala	Tyr	Leu	Leu	Asp	Pro	Ser	Asn	Thr		
				85					90					95			
acc	ccc	gag	ggg	gtg	gcc	cgg	cgc	tac	ggc	ggg	gag	tgg	acg	gag	gag	336	
Thr	Pro	Glu	Gly	Val	Ala	Arg	Arg	Tyr	Gly	Gly	Glu	Trp	Thr	Glu	Glu		
			100					105					110				
gcg	ggg	gag	cgg	gcc	gcc	ctt	tcc	gag	agg	ctc	ttc	gcc	aac	ctg	tgg	384	
Ala	Gly	Glu	Arg	Ala	Ala	Leu	Ser	Glu	Arg	Leu	Phe	Ala	Asn	Leu	Trp		
			115				120					125					
ggg	agg	ctt	gag	ggg	gag	gag	agg	ctc	ctt	tgg	ctt	tac	cgg	gag	gtg	432	
Gly	Arg	Leu	Glu	Gly	Glu	Glu	Arg	Leu	Leu	Trp	Leu	Tyr	Arg	Glu	Val		
	130					135					140						
gag	agg	ccc	ctt	tcc	gct	gtc	ctg	gcc	cac	atg	gag	gcc	acg	ggg	gtg	480	
Glu	Arg	Pro	Leu	Ser	Ala	Val	Leu	Ala	His	Met	Glu	Ala	Thr	Gly	Val		
	145				150					155					160		
cgc	ctg	gac	gtg	gcc	tat	ctc	agg	gcc	ttg	tcc	ctg	gag	gtg	gcc	gag	528	
Arg	Leu	Asp	Val	Ala	Tyr	Leu	Arg	Ala	Leu	Ser	Leu	Glu	Val	Ala	Glu		
				165					170					175			
gag	atc	gcc	cgc	ctc	gag	gcc	gag	gtc	ttc	cgc	ctg	gcc	ggc	cac	ccc	576	
Glu	Ile	Ala	Arg	Leu	Glu	Ala	Glu	Val	Phe	Arg	Leu	Ala	Gly	His	Pro		
			180					185					190				
ttc	aac	ctc	aac	tcc	cgg	gac	cag	ctg	gaa	agg	gtc	ctc	ttt	gac	gag	624	
Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu	Phe	Asp	Glu		
		195					200					205					
cta	ggg	ctt	ccc	gcc	atc	ggc	aag	acg	gag	aag	acc	ggc	aag	cgc	tcc	672	
Leu	Gly	Leu	Pro	Ala	Ile	Gly	Lys	Thr	Glu	Lys	Thr	Gly	Lys	Arg	Ser		
	210					215					220						
acc	agc	gcc	gcc	gtc	ctg	gag	gcc	ctc	cgc	gag	gcc	cac	ccc	atc	gtg	720	
Thr	Ser	Ala	Ala	Val	Leu	Glu	Ala	Leu	Arg	Glu	Ala	His	Pro	Ile	Val		
	225				230					235					240		
gag	aag	atc	ctg	cag	tac	cgg	gag	ctc	acc	aag	ctg	aag	agc	acc	tac	768	
Glu	Lys	Ile	Leu	Gln	Tyr	Arg	Glu	Leu	Thr	Lys	Leu	Lys	Ser	Thr	Tyr		
				245				250						255			
att	gac	ccc	ttg	ccg	gac	ctc	atc	cac	ccc	agg	acg	ggc	cgc	ctc	cac	816	
Ile	Asp	Pro	Leu	Pro	Asp	Leu	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu	His		



260										265					270					
acc	cgc	ttc	aac	cag	acg	gcc	acg	gcc	acg	ggc	agg	cta	agt	agc	tcc	864				
Thr	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser	Ser					
275						280			285											
gat	ccc	aac	ctc	cag	aac	atc	ccc	gtc	cgc	acc	ccg	ctt	ggg	cag	agg	912				
Asp	Pro	Asn	Leu	Gln	Asn	Ile	Pro	Val	Arg	Thr	Pro	Leu	Gly	Gln	Arg					
290						295			300											
atc	cgc	cgg	gcc	ttc	atc	gcc	gag	gag	ggg	tgg	cta	ttg	gtg	gcc	ctg	960				
Ile	Arg	Arg	Ala	Phe	Ile	Ala	Glu	Glu	Gly	Trp	Leu	Leu	Val	Ala	Leu					
305			310			315			320											
gac	tat	agc	cag	ata	gag	ctc	agg	gtg	ctg	gcc	cac	ctc	tcc	ggc	gac	1008				
Asp	Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Leu	Ser	Gly	Asp					
			325			330			335											
gag	aac	ctg	atc	cgg	gtc	ttc	cag	gag	ggg	cgg	gac	atc	cac	acg	gag	1056				
Glu	Asn	Leu	Ile	Arg	Val	Phe	Gln	Glu	Gly	Arg	Asp	Ile	His	Thr	Glu					
340						345			350											
acc	gcc	agc	tgg	atg	ttc	ggc	gtc	ccc	cag	gag	gcc	gtg	gac	ccc	ctg	1104				
Thr	Ala	Ser	Trp	Met	Phe	Gly	Val	Pro	Gln	Glu	Ala	Val	Asp	Pro	Leu					
355						360			365											
atg	cgc	cgg	gcg	gcc	aag	acc	atc	aac	ttc	ggg	gtc	ctc	tac	ggc	atg	1152				
Met	Arg	Arg	Ala	Ala	Lys	Thr	Ile	Asn	Phe	Gly	Val	Leu	Tyr	Gly	Met					
370						375			380											
tcg	gcc	cac	cgc	ctc	tcc	cag	gag	cta	gcc	atc	cct	tac	gag	gag	gcc	1200				
Ser	Ala	His	Arg	Leu	Ser	Gln	Glu	Leu	Ala	Ile	Pro	Tyr	Glu	Glu	Ala					
385			390			395			400											
cag	gcc	ttc	att	gag	cgc	tac	ttt	cag	agc	ttc	ccc	aag	gtg	cgg	gcc	1248				
Gln	Ala	Phe	Ile	Glu	Arg	Tyr	Phe	Gln	Ser	Phe	Pro	Lys	Val	Arg	Ala					
			405			410			415											
tgg	att	gag	aag	acc	ctg	gag	gag	ggc	agg	agg	cgg	ggg	tac	gtg	gag	1296				
Trp	Ile	Glu	Lys	Thr	Leu	Glu	Glu	Gly	Arg	Arg	Arg	Gly	Tyr	Val	Glu					
420						425			430											
acc	ctc	ttc	ggc	cgc	cgc	cgc	tac	gtg	cca	gac	cta	gag	gcc	cgg	gtg	1344				
Thr	Leu	Phe	Gly	Arg	Arg	Arg	Tyr	Val	Pro	Asp	Leu	Glu	Ala	Arg	Val					
435						440			445											
aag	agc	gtg	cgg	gag	gcg	gcc	gag	cgc	atg	gcc	ttc	aac	atg	ccc	gtc	1392				
Lys	Ser	Val	Arg	Glu	Ala	Ala	Glu	Arg	Met	Ala	Phe	Asn	Met	Pro	Val					
450						455			460											
cag	ggc	acc	gcc	gcc	gac	ctc	atg	aag	ctg	gct	atg	gtg	aag	ctc	ttc	1440				
Gln	Gly	Thr	Ala	Ala	Asp	Leu	Met	Lys	Leu	Ala	Met	Val	Lys	Leu	Phe					
465			470			475			480											
ccc	agg	ctg	gag	gaa	atg	ggg	gcc	agg	atg	ctc	ctt	cag	gtc	cac	gac	1488				
Pro	Arg	Leu	Glu	Glu	Met	Gly	Ala	Arg	Met	Leu	Leu	Gln	Val	His	Asp					
			485			490			495											
gag	ctg	gtc	ctc	gag	gcc	cca	aaa	gag	ggg	gcg	gag	gcc	gtg	gcc	cgg	1536				
Glu	Leu	Val	Leu	Glu	Ala	Pro	Lys	Glu	Gly	Ala	Glu	Ala	Val	Ala	Arg					
500						505			510											



ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg 1584  
 Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
           515                          520                          525

gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg 1632  
 Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
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gcc gc 1637  
 Ala  
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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
           20                          25                          30

Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
           35                          40                          45

Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
           50                          55                          60

Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
 65                          70                          75                          80

Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
           85                          90                          95

Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
           100                          105                          110

Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
           115                          120                          125

Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
           130                          135                          140

Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
 145                          150                          155                          160

Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu



165	170	175
Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro		
180	185	190
Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu		
195	200	205
Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser		
210	215	220
Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val		
225	230	235
Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr		
245	250	255
Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His		
260	265	270
Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser		
275	280	285
Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg		
290	295	300
Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu		
305	310	315
Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp		
325	330	335
Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu		
340	345	350
Thr Ala Ser Trp Met Phe Gly Val Pro Gln Glu Ala Val Asp Pro Leu		
355	360	365
Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met		
370	375	380
Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala		
385	390	395
Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala		
405	410	415



Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
420 425 430

Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
435 440 445

Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val  
450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
500 505 510

Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
515 520 525

Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
530 535 540

Ala  
545

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<222> (1)..(1635)

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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
20 25 30

ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag 144  
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
35 40 45

cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc 192



Pro	Tyr	Lys	Ala	Leu	Arg	Asp	Leu	Lys	Glu	Ala	Arg	Gly	Leu	Leu	Ala		
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aaa	gac	ctg	agc	gtt	ctg	gcc	ctg	agg	gaa	ggc	ctt	ggc	ctc	ccg	ccc	240	
Lys	Asp	Leu	Ser	Val	Leu	Ala	Leu	Arg	Glu	Gly	Leu	Gly	Leu	Pro	Pro	80	
65					70				75								
ggc	gac	gac	ccc	atg	ctc	ctc	gcc	tac	ctc	ctg	gac	cct	tcc	aac	acc	288	
Gly	Asp	Asp	Pro	Met	Leu	Leu	Ala	Tyr	Leu	Leu	Asp	Pro	Ser	Asn	Thr	95	
				85					90								
acc	ccc	gag	ggg	gtg	gcc	cgg	cgc	tac	ggc	ggg	gag	tgg	acg	gag	gag	336	
Thr	Pro	Glu	Gly	Val	Ala	Arg	Arg	Tyr	Gly	Gly	Glu	Trp	Thr	Glu	Glu	110	
			100					105									
gcg	ggg	gag	cgg	gcc	gcc	ctt	tcc	gag	agg	ctc	ttc	gcc	aac	ctg	tgg	384	
Ala	Gly	Glu	Arg	Ala	Ala	Leu	Ser	Glu	Arg	Leu	Phe	Ala	Asn	Leu	Trp	125	
			115				120					125					
ggg	agg	ctt	gag	ggg	gag	gag	agg	ctc	ctt	tgg	ctt	tac	cgg	gag	gtg	432	
Gly	Arg	Leu	Glu	Gly	Glu	Glu	Arg	Leu	Leu	Trp	Leu	Tyr	Arg	Glu	Val	140	
	130					135											
gag	agg	ccc	ctt	tcc	gct	gtc	ctg	gcc	cac	atg	gag	gcc	acg	ggg	gtg	480	
Glu	Arg	Pro	Leu	Ser	Ala	Val	Leu	Ala	His	Met	Glu	Ala	Thr	Gly	Val	160	
					150					155							
cgc	ctg	gac	gtg	gcc	tat	ctc	agg	gcc	ttg	tcc	ctg	gag	gtg	gcc	gag	528	
Arg	Leu	Asp	Val	Ala	Tyr	Leu	Arg	Ala	Leu	Ser	Leu	Glu	Val	Ala	Glu	175	
				165					170								
gag	atc	gcc	cgc	ctc	gag	gcc	gag	gtc	ttc	cgc	ctg	gcc	ggc	cac	ccc	576	
Glu	Ile	Ala	Arg	Leu	Glu	Ala	Glu	Val	Phe	Arg	Leu	Ala	Gly	His	Pro	190	
			180					185					190				
ttc	aac	ctc	aac	tcc	cgg	gac	cag	ctg	gaa	agg	gtc	ctc	ttt	gac	gag	624	
Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu	Phe	Asp	Glu	205	
		195					200					205					
cta	ggg	ctt	ccc	gcc	atc	ggc	aag	acg	gag	aag	acc	ggc	aag	cgc	tcc	672	
Leu	Gly	Leu	Pro	Ala	Ile	Gly	Lys	Thr	Glu	Lys	Thr	Gly	Lys	Arg	Ser	220	
	210					215					220						
acc	agc	gcc	gcc	gtc	ctg	gag	gcc	ctc	cgc	gag	gcc	cac	ccc	atc	gtg	720	
Thr	Ser	Ala	Ala	Val	Leu	Glu	Ala	Leu	Arg	Glu	Ala	His	Pro	Ile	Val	240	
					230					235							
gag	aag	atc	ctg	cag	tac	cgg	gag	ctc	acc	aag	ctg	aag	agc	acc	tac	768	
Glu	Lys	Ile	Leu	Gln	Tyr	Arg	Glu	Leu	Thr	Lys	Leu	Lys	Ser	Thr	Tyr	255	
				245					250								
att	gac	ccc	ttg	ccg	gac	ctc	atc	cac	ccc	agg	acg	ggc	cgc	ctc	cac	816	
Ile	Asp	Pro	Leu	Pro	Asp	Leu	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu	His	270	
			260					265					270				
acc	cgc	ttc	aac	cag	acg	gcc	acg	gcc	acg	ggc	agg	cta	agt	agc	tcc	864	
Thr	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser	Ser	285	
			275				280					285					
gat	ccc	aac	ctc	cag	aac	atc	ccc	gtc	cgc	acc	ccg	ctt	ggg	cag	agg	912	
Asp	Pro	Asn	Leu	Gln	Asn	Ile	Pro	Val	Arg	Thr	Pro	Leu	Gly	Gln	Arg		



290	295	300	
atc cgc cgg gcc ttc Ile Arg Arg Ala Phe 305	atc gcc gag gag ggg Ile Ala Glu Glu Gly 310	tgg cta ttg gtg gcc ctg Trp Leu Leu Val Ala Leu 315	960
gac tat agc cag ata Asp Tyr Ser Gln Ile 325	gag ctc agg gtg ctg Glu Leu Arg Val 330	gcc cac ctc tcc ggc gac Ala His Leu Ser Gly Asp 335	1008
gag aac ctg atc cgg gtc ttc Glu Asn Leu Ile Arg Val 340	cag gag ggg cgg gac Gln Glu Gly Arg Asp 345	atc cac acg gag Ile His Thr Glu 350	1056
acc gcc agc tgg atg ttc Thr Ala Ser Trp Met 355	ggc gtc ccc cgg gag Gly Val Pro Arg 360	gcc gtg gac ccc ctg Ala Val Asp Pro 365	1104
atg cgc cgg gcg gcc aag Met Arg Arg Ala Ala Lys 370	acc atc aac ttc ggg gtc Thr Ile Asn Phe Gly 375	ctc tac ggc atg Leu Tyr Gly Met 380	1152
tcg gcc cac cgc ctc tcc Ser Ala His Arg Leu 385	cag gag cta gcc atc cct Gln Glu Leu Ala Ile 390	tac gag gag gcc Tyr Glu Glu Ala 400	1200
cag gcc ttc att gag cgc Gln Ala Phe Ile Glu 405	tac ttt cag agc ttc ccc Tyr Phe Gln Ser Phe 410	aag gtg cgg gcc Lys Val Arg Ala 415	1248
tgg att gag aag acc ctg Trp Ile Glu Lys Thr 420	gag gag ggc agg agg Glu Glu Gly Arg Arg 425	cgg ggg tac gtg gag Arg Gly Tyr Val Glu 430	1296
acc ctc ttc ggc cgc cgc Thr Leu Phe Gly Arg 435	cgc cgc tac gtg cca gac Arg Arg Tyr Val Pro 440	cta gag gcc cgg gtg Leu Glu Ala Arg Val 445	1344
aag agc gtg cgg gag gcg Lys Ser Val Arg Glu 450	gcc gag cgc aag gcc ttc Ala Glu Arg Lys Ala 455	aac atg ccc gtc Asn Met Pro Val 460	1392
cag ggc acc gcc gcc gac Gln Gly Thr Ala Ala 465	ctc atg aag ctg gct atg Leu Met Lys Leu Ala 470	gtg aag ctc ttc Val Lys Leu Phe 475	1440
ccc agg ctg gag gaa atg Pro Arg Leu Glu Glu 485	ggg gcc agg atg ctc ctt Gly Ala Arg Met Leu 490	cag gtc cac gac Gln Val His Asp 495	1488
gag ctg gtc ctc gag gcc Glu Leu Val Leu Glu 500	cca aaa gag ggg gcg Pro Lys Glu Gly Ala 505	gag gcc gtg gcc cgg Glu Ala Val Ala Arg 510	1536
ctg gcc aag gag gtc atg Leu Ala Lys Glu Val 515	gag ggg gtg tat ccc Glu Gly Val Tyr Pro 520	ctg gcc gtg ccc ctg Leu Ala Val Pro 525	1584
gag gtg gag gtg ggg ata Glu Val Glu Val Gly 530	ggg gag gac tgg ctc tcc Glu Glu Asp Trp Leu 535	gcc aag gag gcg Ser Ala Lys Glu Ala 540	1632



gcc gc  
Ala  
545

1637

<210> 87  
<211> 545  
<212> PRT  
<213> *Thermus aquaticus*

<400> 87  
Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala  
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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
20 25 30

Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
35 40 45

Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
50 55 60

Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
65 70 75 80

Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
85 90 95

Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
100 105 110

Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
115 120 125

Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
130 135 140

Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
145 150 155 160

Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
165 170 175

Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
180 185 190

Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu



195	200	205
Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser		
210	215	220
Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val		
225	230	235
Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr		
	245	250
Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His		
	260	265
Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser		
	275	280
Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg		
	290	295
Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu		
305	310	315
Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp		
	325	330
Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu		
	340	345
Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu		
	355	360
Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met		
	370	375
Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala		
385	390	395
Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala		
	405	410
Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu		
	420	425
Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val		
	435	440
		445



Lys Ser Val Arg Glu Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val  
 450 455 460

Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465 470 475 480

Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
 485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
 500 505 510

Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
 515 520 525

Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
 530 535 540

Ala  
 545

<210> 88  
 <211> 1637  
 <212> DNA  
 <213> Thermus aquaticus

<220>  
 <221> CDS  
 <222> (1)..(1635)

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ttc gtg ggc ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt	96
Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu	
20 25 30	
ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag	144
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu	
35 40 45	
cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc	192
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala	
50 55 60	
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc	240
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro	
65 70 75 80	
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc	288



Gly	Asp	Asp	Pro	Met	Leu	Leu	Ala	Tyr	Leu	Leu	Asp	Pro	Ser	Asn	Thr		
				85					90					95			
acc	ccc	gag	ggg	gtg	gcc	cgg	cgc	tac	ggc	ggg	gag	tgg	acg	gag	gag	336	
Thr	Pro	Glu	Gly	Val	Ala	Arg	Arg	Tyr	Gly	Gly	Glu	Trp	Thr	Glu	Glu		
			100					105					110				
gcg	ggg	gag	cgg	gcc	gcc	ctt	tcc	gag	agg	ctc	ttc	gcc	aac	ctg	tgg	384	
Ala	Gly	Glu	Arg	Ala	Ala	Leu	Ser	Glu	Arg	Leu	Phe	Ala	Asn	Leu	Trp		
			115				120					125					
ggg	agg	ctt	gag	ggg	gag	gag	agg	ctc	ctt	tgg	ctt	tac	cgg	gag	gtg	432	
Gly	Arg	Leu	Glu	Gly	Glu	Glu	Arg	Leu	Leu	Trp	Leu	Tyr	Arg	Glu	Val		
	130					135					140						
gag	agg	ccc	ctt	tcc	gct	gtc	ctg	gcc	cac	atg	gag	gcc	acg	ggg	gtg	480	
Glu	Arg	Pro	Leu	Ser	Ala	Val	Leu	Ala	His	Met	Glu	Ala	Thr	Gly	Val		
					150				155						160		
cgc	ctg	gac	gtg	gcc	tat	ctc	agg	gcc	ttg	tcc	ctg	gag	gtg	gcc	gag	528	
Arg	Leu	Asp	Val	Ala	Tyr	Leu	Arg	Ala	Leu	Ser	Leu	Glu	Val	Ala	Glu		
				165					170					175			
gag	atc	gcc	cgc	ctc	gag	gcc	gag	gtc	ttc	cgc	ctg	gcc	ggc	cac	ccc	576	
Glu	Ile	Ala	Arg	Leu	Glu	Ala	Glu	Val	Phe	Arg	Leu	Ala	Gly	His	Pro		
			180					185					190				
ttc	aac	ctc	aac	tcc	cgg	gac	cag	ctg	gaa	agg	gtc	ctc	ttt	gac	gag	624	
Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu	Phe	Asp	Glu		
			195				200					205					
cta	ggg	ctt	ccc	gcc	atc	ggc	aag	acg	gag	aag	acc	ggc	aag	cgc	tcc	672	
Leu	Gly	Leu	Pro	Ala	Ile	Gly	Lys	Thr	Glu	Lys	Thr	Gly	Lys	Arg	Ser		
			210			215					220						
acc	agc	gcc	gcc	gtc	ctg	gag	gcc	ctc	cgc	gag	gcc	cac	ccc	atc	gtg	720	
Thr	Ser	Ala	Ala	Val	Leu	Glu	Ala	Leu	Arg	Glu	Ala	His	Pro	Ile	Val		
					230					235					240		
gag	aag	atc	ctg	cag	tac	cgg	gag	ctc	acc	aag	ctg	aag	agc	acc	tac	768	
Glu	Lys	Ile	Leu	Gln	Tyr	Arg	Glu	Leu	Thr	Lys	Leu	Lys	Ser	Thr	Tyr		
				245					250					255			
att	gac	ccc	ttg	ccg	gac	ctc	atc	cac	ccc	agg	acg	ggc	cgc	ctc	cac	816	
Ile	Asp	Pro	Leu	Pro	Asp	Leu	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu	His		
			260					265					270				
acc	cgc	ttc	aac	cag	acg	gcc	acg	gcc	acg	ggc	agg	cta	agt	agc	tcc	864	
Thr	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser	Ser		
			275				280					285					
gat	ccc	aac	ctc	cag	aac	atc	ccc	gtc	cgc	acc	ccg	ctt	ggg	cag	agg	912	
Asp	Pro	Asn	Leu	Gln	Asn	Ile	Pro	Val	Arg	Thr	Pro	Leu	Gly	Gln	Arg		
			290			295					300						
atc	cgc	cgg	gcc	ttc	atc	gcc	gag	gag	ggg	tgg	cta	ttg	gtg	gcc	ctg	960	
Ile	Arg	Arg	Ala	Phe	Ile	Ala	Glu	Glu	Gly	Trp	Leu	Leu	Val	Ala	Leu		
					310				315						320		
gac	tat	agc	cag	ata	gag	ctc	agg	gtg	ctg	gcc	cac	ctc	tcc	ggc	gac	1008	
Asp	Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Leu	Ser	Gly	Asp		



325								330				335				
gag aac ctg atc cgg gtc ttc cag	gag ggg cgg gac atc cac acg gag	1056														
Glu Asn Leu Ile Arg Val Phe Gln	Glu Gly Arg Asp Ile His Thr Glu															
340	345 350															
acc gcc agc tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg	1104															
Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu																
355	360 365															
atg cgc cgg gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg	1152															
Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met																
370	375 380															
tcg gcc cac cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc	1200															
Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala																
385	390 395 400															
cag gcc ttc att gag cgc aac ttt cag agc ttc ccc aag gtg cgg gcc	1248															
Gln Ala Phe Ile Glu Arg Asn Phe Gln Ser Phe Pro Lys Val Arg Ala																
405	410 415															
tgg att gag aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag	1296															
Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu																
420	425 430															
acc ctc ttc ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg	1344															
Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val																
435	440 445															
aag agc gtg cgg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc	1392															
Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val																
450	455 460															
cag ggc acc gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc	1440															
Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe																
465	470 475 480															
ccc agg ctg gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac	1488															
Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp																
485	490 495															
gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg	1536															
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg																
500	505 510															
ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg	1584															
Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu																
515	520 525															
gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg	1632															
Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala																
530	535 540															
gcc gc	1637															
Ala																
545																

<210> 89  
<211> 545



<212> PRT

<213> *Thermus aquaticus*

<400> 89

Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala  
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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
20 25 30

Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
35 40 45

Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
50 55 60

Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
65 70 75 80

Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
85 90 95

Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
100 105 110

Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
115 120 125

Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
130 135 140

Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
145 150 155 160

Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
165 170 175

Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
180 185 190

Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
195 200 205

Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser  
210 215 220

Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val



225		230		235		240
Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr						
		245		250		255
Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His						
		260		265		270
Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser						
		275		280		285
Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg						
		290		295		300
Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu						
305		310		315		320
Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp						
		325		330		335
Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu						
		340		345		350
Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu						
		355		360		365
Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met						
		370		375		380
Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala						
385		390		395		400
Gln Ala Phe Ile Glu Arg Asn Phe Gln Ser Phe Pro Lys Val Arg Ala						
		405		410		415
Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu						
		420		425		430
Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val						
		435		440		445
Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val						
		450		455		460
Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe						
465		470		475		480



Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp  
485 490 495

Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
500 505 510

Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
515 520 525

Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
530 535 540

Ala  
545

<210> 90  
<211> 1637  
<212> DNA  
<213> *Thermus aquaticus*

<220>  
<221> CDS  
<222> (1) .. (1635)

<400> 90	
agc ccc aag gcc ctg gag gag gcc ccc tgg ccc ccg ccg gaa ggg gcc	48
Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala	
1 5 10 15	
ttc gtg ggc ttt gtg ctt tcc cgc aag gag ccc atg tgg gcc gat ctt	96
Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu	
20 25 30	
ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag	144
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu	
35 40 45	
cct tat aaa gcc ctg agg gac ctg aag gag gcg cgg ggg ctt ctc gcc	192
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala	
50 55 60	
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc	240
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro	
65 70 75 80	
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc	288
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr	
85 90 95	
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag	336
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu	
100 105 110	
gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg	384



Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp	
115 120 125	
ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg	432
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val	
130 135 140	
gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg	480
Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val	
145 150 155 160	
cgc ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag	528
Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu	
165 170 175	
gag atc gcc cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc	576
Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro	
180 185 190	
ttc aac ctc aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag	624
Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu	
195 200 205	
cta ggg ctt ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc	672
Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser	
210 215 220	
acc agc gcc gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg	720
Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val	
225 230 235 240	
gag aag atc ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac	768
Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr	
245 250 255	
att gac ccc ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac	816
Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His	
260 265 270	
acc cgc ttc aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc	864
Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser	
275 280 285	
gat ccc aac ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg	912
Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg	
290 295 300	
atc cgc cgg gcc ttc atc gcc gag gag ggg tgg cta ttg gtg gcc ctg	960
Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu	
305 310 315 320	
gac tat agc cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac	1008
Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp	
325 330 335	
gag aac ctg atc cgg gtc ttc cag gag ggg cgg gac atc cac acg gag	1056
Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu	
340 345 350	
acc gcc agc tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg	1104
Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu	



355	360	365	
atg cgc cgg gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380			1152
tcg gcc cac cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400			1200
cag gcc ttc att gag cgc tgc ttt cag agc ttc ccc aag gtg cgg gcc Gln Ala Phe Ile Glu Arg Cys Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415			1248
tgg att gag aag acc ctg gag gag ggc agg agg cgg ggg tac gtg gag Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430			1296
acc ctc ttc ggc cgc cgc cgc tac gtg cca gac cta gag gcc cgg gtg Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445			1344
aag agc gtg cgg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val 450 455 460			1392
cag ggc acc gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480			1440
ccc agg ctg gag gaa atg ggg gcc agg atg ctc ctt cag gtc cac gac Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp 485 490 495			1488
gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg 500 505 510			1536
ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu 515 520 525			1584
gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala 530 535 540			1632
gcc gc Ala 545			1637
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 Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
 35 40 45  
 Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
 50 55 60  
 Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
 65 70 75 80  
 Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
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 Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
 100 105 110  
 Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
 115 120 125  
 Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
 130 135 140  
 Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
 145 150 155 160  
 Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
 165 170 175  
 Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
 180 185 190  
 Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
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 Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser  
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 Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val  
 225 230 235 240  
 Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr  
 245 250 255  
 Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His



260	265	270
Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser 275 280 285		
Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg 290 295 300		
Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu 305 310 315 320		
Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp 325 330 335		
Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu 340 345 350		
Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu 355 360 365		
Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met 370 375 380		
Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala 385 390 395 400		
Gln Ala Phe Ile Glu Arg Cys Phe Gln Ser Phe Pro Lys Val Arg Ala 405 410 415		
Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu 420 425 430		
Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val 435 440 445		
Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val 450 455 460		
Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe 465 470 475 480		
Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp 485 490 495		
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg 500 505 510		



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Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
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Ala  
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<222> (1)..(1635)

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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu  
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ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag 144  
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu  
35 40 45  
cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc 192  
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
50 55 60  
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc 240  
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
65 70 75 80  
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc 288  
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
85 90 95  
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag 336  
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
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gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg 384  
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
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Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
130 135 140  
gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg 480



Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val	
145 150 155 160	
cgc ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag	528
Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu	
165 170 175	
gag atc gcc cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc	576
Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro	
180 185 190	
ttc aac ctc aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag	624
Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu	
195 200 205	
cta ggg ctt ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc	672
Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser	
210 215 220	
acc agc gcc gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg	720
Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val	
225 230 235 240	
gag aag atc ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac	768
Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr	
245 250 255	
att gac ccc ttg ccg gac ctc atc cac ccc agg acg ggc cgc ctc cac	816
Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His	
260 265 270	
acc cgc ttc aac cag acg gcc acg gcc acg ggc agg cta agt agc tcc	864
Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser	
275 280 285	
gat ccc aac ctc cag aac atc ccc gtc cgc acc ccg ctt ggg cag agg	912
Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg	
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atc cgc cgg gcc ttc aac gcc gag gag ggg tgg cta ttg gtg gcc ctg	960
Ile Arg Arg Ala Phe Asn Ala Glu Glu Gly Trp Leu Leu Val Ala Leu	
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gac tat agc cag ata gag ctc agg gtg ctg gcc cac ctc tcc ggc gac	1008
Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp	
325 330 335	
gag aac ctg atc cgg gtc ttc cag gag ggg agg gac atc cac acg gag	1056
Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu	
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acc gcc agc tgg atg ttc ggc gtc ccc cgg gag gcc gtg gac ccc ctg	1104
Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu	
355 360 365	
atg cgc cgg gcg gcc aag acc atc aac ttc ggg gtc ctc tac ggc atg	1152
Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met	
370 375 380	
tcg gcc cac cgc ctc tcc cag gag cta gcc atc cct tac gag gag gcc	1200
Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala	



385	390	395	400	
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Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala	405	410	415	
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Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu	420	425	430	
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Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val	435	440	445	
aag agc gtg cgg gag gcg gcc gag cgc atg gcc ttc aac atg ccc gtc				1392
Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val	450	455	460	
cag ggc acc gcc gcc gac ctc atg aag ctg gct atg gtg aag ctc ttc				1440
Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe	465	470	475	480
ccc agg ctg gag gaa atg ggg gcc agg atg ccc ctt cag gtc cac gac				1488
Pro Arg Leu Glu Glu Met Gly Ala Arg Met Pro Leu Gln Val His Asp	485	490	495	
gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg				1536
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg	500	505	510	
ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg				1584
Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu	515	520	525	
gag gtg aag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg				1632
Glu Val Lys Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala	530	535	540	
gcc gc				1637
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545				
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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu				
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Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu				
35	40	45		



Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala  
 50 55 60

Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro  
 65 70 75 80

Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
 85 90 95

Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
 100 105 110

Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
 115 120 125

Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
 130 135 140

Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
 145 150 155 160

Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
 165 170 175

Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
 180 185 190

Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
 195 200 205

Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser  
 210 215 220

Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val  
 225 230 235 240

Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr  
 245 250 255

Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His  
 260 265 270

Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser  
 275 280 285

Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg



290		295		300
Ile Arg Arg Ala Phe Asn Ala Glu Glu Gly Trp Leu Leu Val Ala Leu				
305		310		320
Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp				
	325		330	335
Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu				
	340		345	350
Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu				
	355		360	365
Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met				
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Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala				
385		390		400
Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala				
	405		410	415
Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu				
	420		425	430
Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val				
	435		440	445
Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val				
	450		455	460
Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe				
465		470		480
Pro Arg Leu Glu Glu Met Gly Ala Arg Met Pro Leu Gln Val His Asp				
	485		490	495
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg				
	500		505	510
Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu				
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Glu Val Lys Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala				
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Ala  
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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu
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ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag      144
Leu Ala Leu Ala Ala Ala Arg Gly Arg Val His Arg Ala Pro Glu
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Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala
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aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc      240
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro
65          70          75          80

ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc      288
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr
          85          90          95

acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag      336
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu
          100          105          110

gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg      384
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp
          115          120          125

ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg      432
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val
          130          135          140

gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg      480
Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val
145          150          155          160

cgc ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag      528
Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu
          165          170          175

gag atc gcc cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc      576

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Glu	Ile	Ala	Arg	Leu	Glu	Ala	Glu	Val	Phe	Arg	Leu	Ala	Gly	His	Pro			
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ttc	aac	ctc	aac	tcc	cgg	gac	cag	ctg	gaa	agg	gtc	ctc	ttt	gac	gag		624	
Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu	Phe	Asp	Glu			
		195				200						205						
cta	ggg	ctt	ccc	gcc	atc	ggc	aag	acg	gag	aag	acc	ggc	aag	cgc	tcc		672	
Leu	Gly	Leu	Pro	Ala	Ile	Gly	Lys	Thr	Glu	Lys	Thr	Gly	Lys	Arg	Ser			
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Thr	Ser	Ala	Ala	Val	Leu	Glu	Ala	Leu	Arg	Glu	Ala	His	Pro	Ile	Val			
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gag	aag	atc	ctg	cag	tac	cgg	gag	ctc	acc	aag	ctg	aag	agc	acc	tac		768	
Glu	Lys	Ile	Leu	Gln	Tyr	Arg	Glu	Leu	Thr	Lys	Leu	Lys	Ser	Thr	Tyr			
				245					250					255				
att	gac	ccc	ttg	ccg	gac	ctc	atc	cac	ccc	agg	acg	ggc	cgc	ctc	cac		816	
Ile	Asp	Pro	Leu	Pro	Asp	Leu	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu	His			
			260					265					270					
acc	cgc	ttc	aac	cag	acg	gcc	acg	gcc	acg	ggc	agg	cta	agt	agc	tcc		864	
Thr	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser	Ser			
		275					280					285						
gat	ccc	aac	ctc	cag	aac	atc	ccc	gtc	cgc	acc	ccg	ctt	ggg	cag	agg		912	
Asp	Pro	Asn	Leu	Gln	Asn	Ile	Pro	Val	Arg	Thr	Pro	Leu	Gly	Gln	Arg			
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atc	cgc	cgg	gcc	ttc	atc	gcc	gag	gag	ggg	tgg	cta	ttg	gtg	gcc	ctg		960	
Ile	Arg	Arg	Ala	Phe	Ile	Ala	Glu	Glu	Gly	Trp	Leu	Leu	Val	Ala	Leu			
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Asp	Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Leu	Ser	Gly	Asp			
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gag	aac	ctg	atc	cgg	gtc	ttc	cag	gag	ggg	cgg	gac	atc	cac	acg	gag		1056	
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Thr	Ala	Ser	Trp	Met	Phe	Gly	Val	Pro	Arg	Glu	Ala	Val	Asp	Pro	Leu			
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atg	cgc	cgg	gcg	gcc	aag	acc	atc	aac	ttc	ggg	gtc	ctc	tac	ggc	atg		1152	
Met	Arg	Arg	Ala	Ala	Lys	Thr	Ile	Asn	Phe	Gly	Val	Leu	Tyr	Gly	Met			
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Ser	Ala	His	Arg	Leu	Ser	Gln	Glu	Leu	Ala	Ile	Pro	Tyr	Glu	Glu	Ala			
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cag	gcc	ttc	att	gag	cgc	tgc	ttt	cag	agc	ttc	ccc	aag	gtg	cgg	gcc		1248	
Gln	Ala	Phe	Ile	Glu	Arg	Cys	Phe	Gln	Ser	Phe	Pro	Lys	Val	Arg	Ala			
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tgg	att	gag	aag	acc	ctg	gag	gag	ggc	agg	agg	cgg	ggg	tac	gtg	gag		1296	
Trp	Ile	Glu	Lys	Thr	Leu	Glu	Glu	Gly	Arg	Arg	Arg	Gly	Tyr	Val	Glu			



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Lys	Ser	Val	Arg	Glu	Ala	Ala	Glu	Arg	Met	Ala	Phe	Asn	Met	Pro	Val																								
450										455										460																			
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Gln	Gly	Thr	Ala	Ala	Asp	Leu	Met	Lys	Leu	Ala	Met	Val	Glu	Leu	Phe																								
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Pro	Arg	Leu	Glu	Glu	Met	Gly	Ala	Arg	Met	Leu	Leu	Gln	Val	His	Asp																								
485										490										495																			
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Glu	Leu	Val	Leu	Glu	Ala	Pro	Lys	Glu	Gly	Ala	Glu	Ala	Val	Ala	Arg																								
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Leu	Ala	Lys	Glu	Val	Met	Glu	Gly	Val	Tyr	Pro	Leu	Ala	Val	Pro	Leu																								
515										520										525																			
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Glu	Val	Glu	Val	Gly	Ile	Gly	Glu	Asp	Trp	Leu	Ser	Ala	Lys	Glu	Ala																								
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gcc	gc															1637																							
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Phe	Val	Gly	Phe	Val	Leu	Ser	Arg	Lys	Glu	Pro	Met	Trp	Ala	Asp	Leu																								
			20					25					30																										
Leu	Ala	Leu	Ala	Ala	Ala	Arg	Gly	Gly	Arg	Val	His	Arg	Ala	Pro	Glu																								
		35					40					45																											
Pro	Tyr	Lys	Ala	Leu	Arg	Asp	Leu	Lys	Glu	Ala	Arg	Gly	Leu	Leu	Ala																								
	50					55					60																												
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65					70					75				80																									



Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr  
 85 90 95

Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu  
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Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
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Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
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Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
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Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
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Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
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Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
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Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser  
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Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val  
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Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr  
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Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His  
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Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser  
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Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg  
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Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu  
 305 310 315 320

Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp



	325		330		335
Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu	340	345	350		
Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu	355	360	365		
Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met	370	375	380		
Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala	385	390	395	400	
Gln Ala Phe Ile Glu Arg Cys Phe Gln Ser Phe Pro Lys Val Arg Ala	405	410	415		
Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu	420	425	430		
Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val	435	440	445		
Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val	450	455	460		
Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Glu Leu Phe	465	470	475	480	
Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp	485	490	495		
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg	500	505	510		
Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu	515	520	525		
Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala	530	535	540		
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<212> DNA  
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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu
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ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag     144
Leu Ala Leu Ala Ala Ala Arg Gly Arg Val His Arg Ala Pro Glu
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cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc     192
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala
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aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc     240
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro
65          70          75          80

ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc     288
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr
          85          90          95

acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag     336
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu
          100          105          110

gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg     384
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp
          115          120          125

ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg     432
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val
          130          135          140

gag agg ccc ctt tcc gct gtc ctg gcc cac atg gag gcc acg ggg gtg     480
Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val
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cgc ctg gac gtg gcc tat ctc agg gcc ttg tcc ctg gag gtg gcc gag     528
Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu
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gag atc gcc cgc ctc gag gcc gag gtc ttc cgc ctg gcc ggc cac ccc     576
Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro
          180          185          190

ttc aac ctc aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gaa     624
Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu
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cta ggg ctt ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc     672

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Leu	Gly	Leu	Pro	Ala	Ile	Gly	Lys	Thr	Glu	Lys	Thr	Gly	Lys	Arg	Ser		
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Thr	Ser	Ala	Ala	Val	Leu	Glu	Ala	Leu	Arg	Glu	Ala	His	Pro	Ile	Val	240	
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Glu	Lys	Ile	Leu	Gln	Tyr	Arg	Glu	Leu	Thr	Lys	Leu	Lys	Ser	Thr	Tyr	255	
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att	gac	ccc	ttg	cgg	ggc	ctc	atc	cac	ccc	agg	acg	ggc	cgc	ctc	cac	816	
Ile	Asp	Pro	Leu	Pro	Gly	Leu	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu	His	270	
			260					265									
acc	cgc	ttc	aac	cag	acg	gcc	acg	gcc	acg	ggc	agg	cta	agt	agc	tcc	864	
Thr	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser	Ser	285	
		275						280									
gat	ccc	aac	ctc	cag	aac	atc	ccc	gtc	cgc	acc	ccg	ctt	ggg	cag	agg	912	
Asp	Pro	Asn	Leu	Gln	Asn	Ile	Pro	Val	Arg	Thr	Pro	Leu	Gly	Gln	Arg	300	
	290					295											
atc	cgc	cgg	gcc	ttc	atc	gcc	gag	gag	ggg	tgg	cta	ttg	gtg	gcc	ctg	960	
Ile	Arg	Arg	Ala	Phe	Ile	Ala	Glu	Glu	Gly	Trp	Leu	Leu	Val	Ala	Leu	320	
305					310					315							
gac	tat	agc	cag	ata	gag	ctc	agg	gtg	ctg	gcc	cac	ctc	tcc	ggc	gac	1008	
Asp	Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Leu	Ser	Gly	Asp	335	
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Glu	Asn	Leu	Ile	Arg	Val	Phe	Gln	Glu	Gly	Arg	Asp	Ile	His	Thr	Glu	350	
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Thr	Ala	Ser	Trp	Met	Phe	Gly	Val	Pro	Arg	Glu	Ala	Val	Asp	Pro	Leu	365	
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Met	Arg	Arg	Ala	Ala	Lys	Thr	Ile	Asn	Phe	Gly	Val	Leu	Tyr	Gly	Met	380	
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Ser	Ala	His	Arg	Leu	Ser	Gln	Glu	Leu	Ala	Ile	Pro	Tyr	Glu	Glu	Ala	400	
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cag	gcc	ttc	att	gag	cgc	tac	ttt	cag	agc	ttc	ccc	aag	gtg	cgg	gcc	1248	
Gln	Ala	Phe	Ile	Glu	Arg	Tyr	Phe	Gln	Ser	Phe	Pro	Lys	Val	Arg	Ala	415	
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tgg	att	gag	aag	acc	ctg	gag	gag	ggc	agg	agg	cgg	ggg	tac	gtg	gag	1296	
Trp	Ile	Glu	Lys	Thr	Leu	Glu	Glu	Gly	Arg	Arg	Arg	Gly	Tyr	Val	Glu	430	
			420					425									
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Thr	Leu	Phe	Gly	Arg	Arg	Arg	Tyr	Val	Pro	Asp	Leu	Glu	Ala	Arg	Val	445	
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Lys	Ser	Val	Arg	Glu	Ala	Ala	Glu	Arg	Met	Ala	Phe	Asn	Met	Pro	Val		



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Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe			
465	470	475	480
ccc agg ctg gag gaa atg ggg gcc agg atg ctc ctt cag atc cac gac			1488
Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Ile His Asp			
	485	490	495
gag ctg gtc ctc gag gcc cca aaa gag ggg gcg gag gcc gtg gcc cgg			1536
Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg			
	500	505	510
ctg gcc aag gag gtc atg gag ggg gtg tat ccc ctg gcc gtg ccc ctg			1584
Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu			
	515	520	525
gag gtg gag gtg ggg ata ggg gag gac tgg ctc tcc gcc aag gag gcg			1632
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Ala			
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Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu			
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Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala			
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Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro			
65	70	75	80
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr			
	85	90	95
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu			
	100	105	110



Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp  
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Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val  
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Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
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Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
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Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
 180 185 190

Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
 195 200 205

Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser  
 210 215 220

Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val  
 225 230 235 240

Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr  
 245 250 255

Ile Asp Pro Leu Pro Gly Leu Ile His Pro Arg Thr Gly Arg Leu His  
 260 265 270

Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser  
 275 280 285

Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg  
 290 295 300

Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu  
 305 310 315 320

Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp  
 325 330 335

Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu  
 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu



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 Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met  
       370                      375                      380  
 Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala  
 385                      390                      395                      400  
 Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala  
                     405                      410                      415  
 Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu  
                     420                      425                      430  
 Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val  
                     435                      440                      445  
 Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val  
                     450                      455                      460  
 Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe  
 465                      470                      475                      480  
 Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Ile His Asp  
                     485                      490                      495  
 Glu Leu Val Leu Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg  
                     500                      505                      510  
 Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu  
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 Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala  
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Ala  
545

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 <212> DNA  
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<400> 98



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Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu	
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ctg gcc ctg gcc gcc gcc agg ggg ggc cgg gtc cac cgg gcc ccc gag	144
Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu	
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cct tat aaa gcc ctc agg gac ctg aag gag gcg cgg ggg ctt ctc gcc	192
Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala	
50 55 60	
aaa gac ctg agc gtt ctg gcc ctg agg gaa ggc ctt ggc ctc ccg ccc	240
Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro	
65 70 75 80	
ggc gac gac ccc atg ctc ctc gcc tac ctc ctg gac cct tcc aac acc	288
Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr	
85 90 95	
acc ccc gag ggg gtg gcc cgg cgc tac ggc ggg gag tgg acg gag gag	336
Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu	
100 105 110	
gcg ggg gag cgg gcc gcc ctt tcc gag agg ctc ttc gcc aac ctg tgg	384
Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp	
115 120 125	
ggg agg ctt gag ggg gag gag agg ctc ctt tgg ctt tac cgg gag gtg	432
Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val	
130 135 140	
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Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val	
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Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro	
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ttc aac ctc aac tcc cgg gac cag ctg gaa agg gtc ctc ttt gac gag	624
Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu	
195 200 205	
cta ggg ctt ccc gcc atc ggc aag acg gag aag acc ggc aag cgc tcc	672
Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser	
210 215 220	
acc agc gcc gcc gtc ctg gag gcc ctc cgc gag gcc cac ccc atc gtg	720
Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val	
225 230 235 240	
gag aag atc ctg cag tac cgg gag ctc acc aag ctg aag agc acc tac	768



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Ile	Asp	Pro	Leu	Pro	Asp	Leu	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu	His		
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Thr	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser	Ser		
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Asp	Pro	Asn	Leu	Gln	Asn	Ile	Pro	Val	Arg	Thr	Pro	Leu	Gly	Gln	Arg		
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Ile	Arg	Arg	Ala	Phe	Ile	Ala	Glu	Glu	Gly	Trp	Leu	Leu	Val	Ala	Leu		
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gac	tat	aac	cag	ata	gag	ctc	agg	gtg	ctg	gcc	cac	ctc	tcc	ggc	gac		1008
Asp	Tyr	Asn	Gln	Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Leu	Ser	Gly	Asp		
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gag	aac	ctg	atc	cgg	gtc	ttc	cag	gag	ggg	cgg	gac	atc	cac	acg	gag		1056
Glu	Asn	Leu	Ile	Arg	Val	Phe	Gln	Glu	Gly	Arg	Asp	Ile	His	Thr	Glu		
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acc	gcc	agc	tgg	atg	ttc	ggc	gtc	ccc	cgg	gag	gcc	gtg	gac	ccc	ctg		1104
Thr	Ala	Ser	Trp	Met	Phe	Gly	Val	Pro	Arg	Glu	Ala	Val	Asp	Pro	Leu		
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Met	Arg	Arg	Ala	Ala	Lys	Thr	Ile	Asn	Phe	Gly	Val	Leu	Tyr	Gly	Met		
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tcg	gcc	cac	cgc	ctc	tcc	cag	gag	cta	gcc	atc	cct	tac	gag	gag	gcc		1200
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Gln	Ala	Phe	Ile	Glu	Arg	Tyr	Phe	Gln	Ser	Phe	Pro	Lys	Val	Arg	Ala		
				405						410				415			
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Trp	Ile	Glu	Lys	Thr	Leu	Glu	Glu	Gly	Arg	Arg	Arg	Gly	Tyr	Val	Glu		
				420					425					430			
acc	ctc	ttc	ggc	cgc	cgc	cgc	tac	gtg	cca	gac	cta	gag	gcc	cgg	gtg		1344
Thr	Leu	Phe	Gly	Arg	Arg	Arg	Tyr	Val	Pro	Asp	Leu	Glu	Ala	Arg	Val		
				435					440					445			
aag	agc	gtg	cgg	gag	gcg	gcc	gag	cgc	atg	gcc	ttc	aac	atg	ccc	gtc		1392
Lys	Ser	Val	Arg	Glu	Ala	Ala	Glu	Arg	Met	Ala	Phe	Asn	Met	Pro	Val		
				450					455					460			
cag	ggc	acc	gcc	gcc	gac	ctc	atg	aag	ctg	gct	atg	gtg	aag	ctc	ttc		1440
Gln	Gly	Thr	Ala	Ala	Asp	Leu	Met	Lys	Leu	Ala	Met	Val	Lys	Leu	Phe		
465						470				475					480		
ccc	agg	ctg	gag	gaa	atg	ggg	gcc	agg	atg	ctc	ctt	cag	gtc	cac	gac		1488
Pro	Arg	Leu	Glu	Glu	Met	Gly	Ala	Arg	Met	Leu	Leu	Gln	Val	His	Asp		



485										490					495					
gag	ctg	gtc	ctc	gag	gcc	cca	aaa	gag	ggg	gcg	gag	gcc	gtg	gcc	cgg	1536				
Glu	Leu	Val	Leu	Glu	Ala	Pro	Lys	Glu	Gly	Ala	Glu	Ala	Val	Ala	Arg					
500				505				510												
ctg	gcc	aag	gag	gtc	atg	gag	ggg	gtg	tat	ccc	ctg	gcc	gtg	tcc	ctg	1584				
Leu	Ala	Lys	Glu	Val	Met	Glu	Gly	Val	Tyr	Pro	Leu	Ala	Val	Ser	Leu					
515				520				525												
gag	gtg	gag	gtg	ggg	ata	ggg	gag	gac	tgg	ctc	tcc	gcc	aag	gag	gcg	1632				
Glu	Val	Glu	Val	Gly	Ile	Gly	Glu	Asp	Trp	Leu	Ser	Ala	Lys	Glu	Ala					
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gcc	gc														1637					
Ala																				
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Phe	Val	Gly	Phe	Val	Leu	Ser	Arg	Lys	Glu	Pro	Met	Trp	Ala	Asp	Leu					
20				25				30												
Leu	Ala	Leu	Ala	Ala	Ala	Arg	Gly	Gly	Arg	Val	His	Arg	Ala	Pro	Glu					
35				40				45												
Pro	Tyr	Lys	Ala	Leu	Arg	Asp	Leu	Lys	Glu	Ala	Arg	Gly	Leu	Leu	Ala					
50				55				60												
Lys	Asp	Leu	Ser	Val	Leu	Ala	Leu	Arg	Glu	Gly	Leu	Gly	Leu	Pro	Pro					
65				70				75				80								
Gly	Asp	Asp	Pro	Met	Leu	Leu	Ala	Tyr	Leu	Leu	Asp	Pro	Ser	Asn	Thr					
85				90				95												
Thr	Pro	Glu	Gly	Val	Ala	Arg	Arg	Tyr	Gly	Gly	Glu	Trp	Thr	Glu	Glu					
100				105				110												
Ala	Gly	Glu	Arg	Ala	Ala	Leu	Ser	Glu	Arg	Leu	Phe	Ala	Asn	Leu	Trp					
115				120				125												
Gly	Arg	Leu	Glu	Gly	Glu	Glu	Arg	Leu	Leu	Trp	Leu	Tyr	Arg	Glu	Val					
130				135				140												



Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val  
 145 150 155 160

Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu  
 165 170 175

Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro  
 180 185 190

Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu  
 195 200 205

Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser  
 210 215 220

Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val  
 225 230 235 240

Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr  
 245 250 255

Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His  
 260 265 270

Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser  
 275 280 285

Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg  
 290 295 300

Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu  
 305 310 315 320

Asp Tyr Asn Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp  
 325 330 335

Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu  
 340 345 350

Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu  
 355 360 365

Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met  
 370 375 380

Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala







Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Asp Ala Val Ile Val  
 50 55 60

Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Gly Gly  
 65 70 75 80

Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln Leu  
 85 90 95

Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Leu Ala Arg Leu Glu  
 100 105 110

Val Pro Gly Tyr Glu Ala Asp Asp Val Leu Ala Ser Leu Ala Lys Lys  
 115 120 125

Ala Glu Lys Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Lys Asp  
 130 135 140

Leu Tyr Gln Leu Leu Ser Asp Arg Ile His Val Leu His Pro Glu Gly  
 145 150 155 160

Tyr Leu Ile Thr Pro Ala Trp Leu Trp Glu Lys Tyr Gly Leu Arg Pro  
 165 170 175

Asp Gln Trp Ala Asp Tyr Arg Ala Leu Thr Gly Asp Glu Ser Asp Asn  
 180 185 190

Leu Pro Gly Val Lys Gly Ile Gly Glu Lys Thr Ala Arg Lys Leu Leu  
 195 200 205

Glu Glu Trp Gly Ser Leu Glu Ala Leu Leu Lys Asn Leu Asp Arg Leu  
 210 215 220

Lys Pro Ala Ile Arg Glu Lys Ile Leu Ala His Met Asp Asp Leu Lys  
 225 230 235 240

Leu Ser Trp Asp Leu Ala Lys Val Arg Thr Asp Leu Pro Leu Glu Val  
 245 250 255

Asp Phe Ala Lys Arg Arg Glu Pro Asp Arg Glu Arg Leu Arg Ala Phe  
 260 265 270

Leu Glu Arg Leu Glu Phe Gly Ser Leu Leu His Glu Phe Gly Leu Leu  
 275 280 285

Glu Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly



290	295	300
Ala Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp 305 310 315 320		
Leu Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro 325 330 335		
Glu Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu 340 345 350		
Ala Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro 355 360 365		
Pro Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn 370 375 380		
Thr Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu 385 390 395 400		
Glu Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu 405 410 415		
Trp Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu 420 425 430		
Val Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly 435 440 445		
Val Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala 450 455 460		
Glu Glu Ile Ala Arg Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His 465 470 475 480		
Pro Phe Asn Leu Asn Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp 485 490 495		
Glu Leu Gly Leu Pro Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg 500 505 510		
Ser Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile 515 520 525		
Val Glu Lys Ile Leu Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr 530 535 540		



Tyr Ile Asp Pro Leu Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu  
 545 550 555 560

His Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser  
 565 570 575

Ser Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln  
 580 585 590

Arg Ile Arg Arg Ala Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala  
 595 600 605

Leu Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly  
 610 615 620

Asp Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr  
 625 630 635 640

Glu Thr Ala Ser Trp Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro  
 645 650 655

Leu Met Arg Arg Ala Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly  
 660 665 670

Met Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu  
 675 680 685

Ala Gln Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg  
 690 695 700

Ala Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val  
 705 710 715 720

Glu Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg  
 725 730 735

Val Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro  
 740 745 750

Val Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu  
 755 760 765

Phe Pro Arg Leu Glu Glu Met Gly Ala Arg Met Leu Leu Gln Val His  
 770 775 780



Asp Glu Leu Val Leu Glu Ala Pro Lys Glu Arg Ala Glu Ala Val Ala  
 785 790 795 800

Arg Leu Ala Lys Glu Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro  
 805 810 815

Leu Glu Val Glu Val Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu  
 820 825 830

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 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic oligonucleotide

<400> 101  
 ggatggaacc gctggagagc aactg 25

<210> 102  
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 Ser Gly Gly Gly Gly  
 1 5  
  
 <210> 108  
 <211> 6  
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 <400> 108  
 His His His His His His  
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